FLIGHT
The AIRCRAFT ENGINEER & AIRSHIPS

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Founder and Editor: STANLEY SPOONER

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Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in the following list:

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Feb. 23	Lecture, "Some possible Improvements in Aero Engine Installation," by G. R. Irvine, before Students' Section R.Ae.S.
Mar. 2	Lecture, "Testing Aircraft to Destruction," by W. D. Douglas, before R.Ae.S.
Mar. 16	Lecture, "Radiological Research," by Dr. V. E. Pullin, before R.Ae.S.
Mar. 26–April 2	Nice Meeting
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April 17	R.Ae.C. Race Meeting, at Waddon
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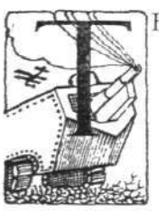
Sept.	Italian Grand Prix
Sept. or Oct.	R.Ae.C. Race Meeting, at Waddon
Sept. 22 ...	Coupe Deutsche (300 kil.)

EDITORIAL COMMENT



THE "axe" has fallen at last. The report of the Geddes Committee, or, to give it its official title, the Committee on National Expenditure, has been published. As far as we are concerned, the portion of the report (reproduced elsewhere in this issue) which interests us most is that dealing with reductions in the Air Force Estimates and their relation to the reductions suggested for the Army and Navy. On the whole there is, we think, not a great deal to find fault with in the report, although we must disagree on certain points to which we will refer later. Generally speaking, however, the suggestions made appear to us to be sound, and, always bearing in mind the vital necessity for reductions, it must be remembered that we have to be content with something less than what we should like to have claimed. There runs through the report, almost as a guiding thread, a realisation of the future importance of the R.A.F., and one can read between the lines a desire to point to the older services and say, "Unless you are yourselves capable of doing this or that work more efficiently, it can and should be better done by the Air Force!" This is wholly encouraging to those who believe that in the future the Air Force will be our first line of defence, and as such is entitled to financial support in increasing proportion as it proves capable of taking over many of the functions of the Navy and Army. The undercurrent formed by this realisation comes to the surface in the introductory remarks, in which the report states: "The necessity for this (the consideration of the cost of the defence of the Empire as a whole) is much more apparent now than it was before the War, more especially because of the advent of the Air arm, which has come so much to the front, either as an addition to the older fighting services, or in substitution for them."

Interim Report of the Geddes Committee

In view of this acknowledgment of the capability of the R.A.F. to supplant the older Services in many directions, and doing it more cheaply, it is to some extent disheartening to find that the percentage of suggested reduction for the R.A.F. is very considerably greater than that of the Navy and Army. In the case of the Navy the reductions suggested amount to approximately 26 per cent., and those suggested for

the Army to a little more (about 26·6 per cent.), while the 5½ million reduction proposed for the R.A.F. amounts to as much as 35 per cent. If it were not for the fact that a great proportion of the reductions suggested are based upon certain reductions in personnel and organisations, which are considered to represent overlapping and waste or luxury, we should take a more serious view of the "cuts" proposed. It must, however, be conceded that in any organisation there is room for improvement, and it would be futile to claim that the efficiency of the R.A.F. reaches the 100 per cent. figure; nor, for that matter, do those of the Army and Navy, and we venture the opinion that the R.A.F. as a whole is at least as efficiently conducted as are the other Services. That, however, is scarcely the point. Reductions all round have to be made, whether we like it or not, and the main thing is to effect them where they will do least harm. We think that, taking a long view of the situation, the suggestion of doing away with Halton is probably unwise, as the training of personnel is one of the greatest importance. It may be conceded, however, that for the time being, at any rate, the other establishments, such as Cranwell, can do all that is required, and therefore, although we would rather not have seen Halton scrapped, we are not inclined to quarrel violently with the Committee over its decision in this respect.

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Technical Equipment

There are, however, certain other respects in which we cannot find ourselves in agreement with the suggestions made. For instance, the Committee suggests a reduction of £1,000,000 under the Vote for Technical Equipment. Progress in aviation is so rapid that material very soon becomes obsolete. The retention of obsolete or obsolescent machines may therefore easily prove not only at least as but more costly in the long run than the acquisition of progressively modern flying craft. To us it seems that to suggest saving a million on technical equipment is a very short-sighted policy. The Committee itself states in its report that "It can no longer be denied that by the intelligent application of air power it is possible to utilise machinery in substitution for and not as a mere addition to man-power." Therefore, one would have thought that a million pounds cut under the heading of Technical Equipment would prevent such substitution of machinery for man-power, or at any rate tend to minimise its full utilisation. If the Committee have in mind obtaining the greater part of the million reduction from the certainly somewhat excessive figures for motor and other transport, and for buildings and land, we think the efficiency of the R.A.F. would not suffer greatly, but if a large portion is to be deducted from the sums set aside for the purchase of new and improved machines, then we do say that the efficiency cannot but be very seriously affected. The whole science is as yet so young that progress is abnormally rapid, and a machine is generally obsolete within a few months of its launching.

The report states that a saving can be effected in technical equipment, owing to the suggested reduction of the number of squadrons from 32½ to 24. We do not pose as military experts, and consequently we do not presume to say whether such a reduction is justifiable, but even if it is, it should be remembered that, as suggested by the Committee, the use of R.A.F. units to replace Army units abroad will mean using the flying stock in countries whose climatic conditions are such as to call for frequent renewal of machines, quite apart from the question of crashes.

Closely connected with the question of technical equipment is that of research. The Committee realises that there is probably more justification for continued research in connection with the Air Force than there is in the older Services. Nevertheless, it suggests that the amount spent on aeronautical research should be limited to £1,000,000. This may seem a generous sum, but those intimately connected with the extraordinarily complicated nature of the different classes of research required will realise that a million will not go very far. We would also point out that it is reasonable to suppose that a fairly liberal expenditure on research might, and in all probability would, result in establishing information that would, in the long run, save vast sums on new types of machines.

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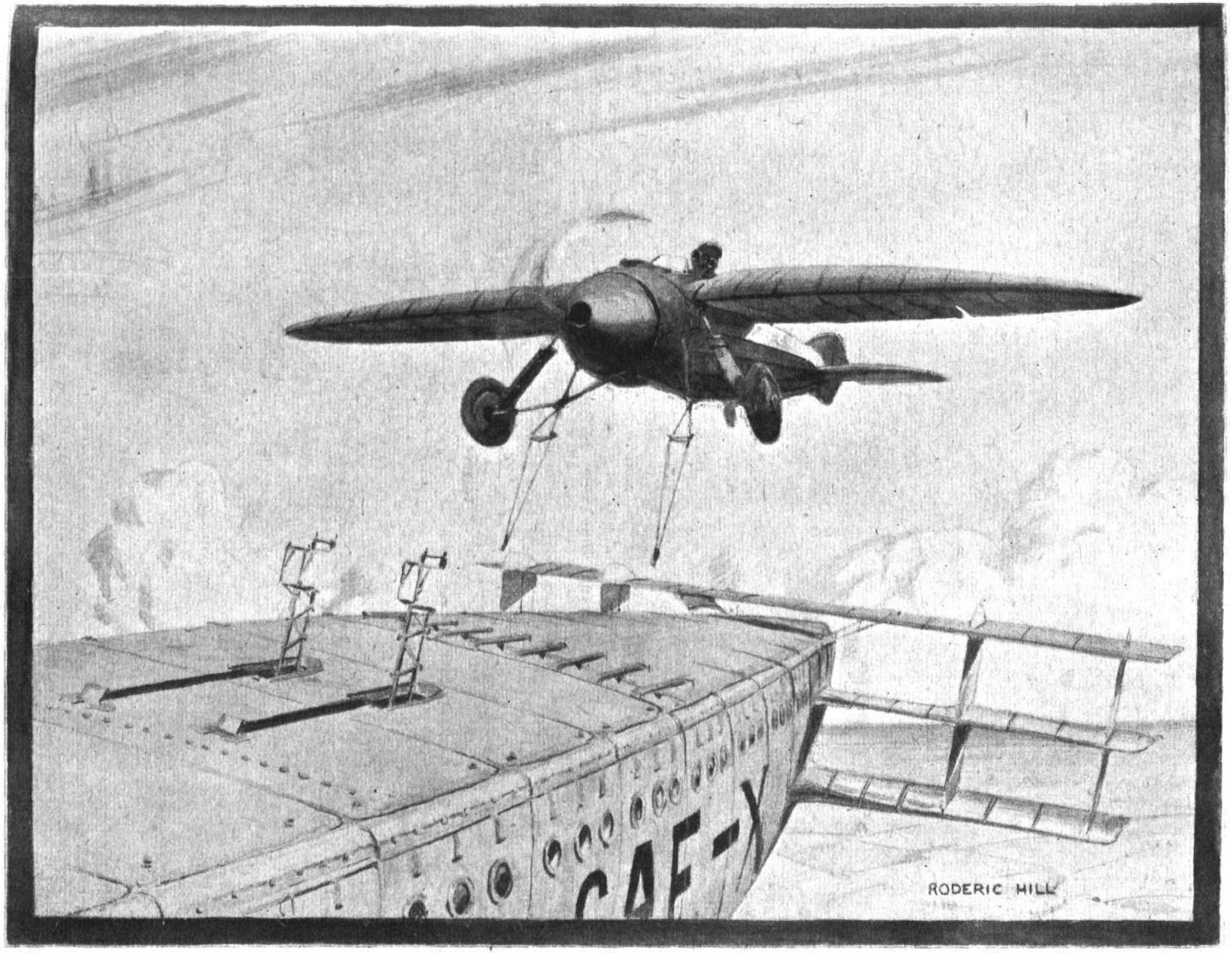
A Ministry of Defence

The Committee strongly urge the co-ordination of the three fighting Services under a Ministry of Defence, in order that the necessary economies may be effected and overlapping and duplication avoided. Again, as we do not pose as military experts, we shall not presume to say whether or not such a scheme would be in the best interests of the country. We would say, nevertheless, that to us it appears that, if the right man can be found, such a Ministry would tend to ensure that each of the fighting Services did its share of the work of defending the Empire, and was supplied from the funds available in direct proportion to its value in Imperial defence. The main difficulty, to our mind, is that of finding the right man for the position. He would have to be a man of the very strongest personality, to begin with, and it is essential that he should not have been connected directly or indirectly with either of the three Services, otherwise he could hardly be expected to be entirely unbiassed when it came to considering and weighing the respective claims made by the different Services. This would necessarily mean that he would not have any very intimate technical knowledge of any of the Services. That, we think, would not necessarily be a disadvantage. A judge has continually to hear cases in which evidence of a highly technical nature is given. It is for him to decide which of the contending parties has succeeded in proving its case. And so with a Minister for Defence. He would hear the claims made by the Imperial Staff of the three Services, of which the Ministry should be composed, and would have to decide, on the evidence presented, which Service had the greatest claim—in other words, which Service could do the particular piece of work most efficiently. On the whole, we are inclined to think that the establishment of such a Ministry would be an advantage. That it will materialise in the coming financial year is, perhaps, open to doubt. It will mean a great amount of reorganisation and will necessarily take time. This fact need not, however, mean that the scheme will be permanently abandoned; and certainly, when, as is bound to occur sooner or later, the R.A.F. is *the* great service, it will be far better for it to have been removed from the shackling effects of the jealousies of the older Services.



"A GLIMPSE OF THE FUTURE" *(From the original by Roderic Hill.)*

The picture shows a fast single-seater customs aeroplane about to settle on the alighting deck of a big air liner. At a signal from the customs official, who incidentally flies his own aeroplane, the captain of the air liner brings his ship to a steady speed and the pneumatic trap on the alighting deck is set ready. Gliding a little faster than the liner, the customs aeroplane approaches over the tail. As it nears the trap it reduces speed slightly until, except for a lateral swaying, it hovers apparently motionless. For a few seconds the "dactyls" on its under-carriage flicker in the jaws of the trap; then there is a metallic clang and the little aeroplane is safe, moored fast to the liner. The customs official slips out from his cockpit, and, crouching in the wind, makes his way forward. When 50 feet in front of the trap he suddenly disappears down a well, where we leave him to commence his round of necessary, if unpleasant, duties.

The Position of Civil Aviation

Though the Geddes Report pays relatively little attention to the question of Civil Aviation, it is suggested that a reduction of £400,000 could be effected in this department. Considering that the amount provided for 1922–23 is only £700,000, a reduction of more than one-half is a little too drastic to be contemplated, especially in view of the assistance which civil aviation will and can render to the R.A.F. in the matter of reserves. Apparently the Committee considers the £200,000 per annum voted for the next three years a commitment which cannot be escaped, and the saving of £400,000, it is suggested, should come almost wholly out of personnel. It is also thought by the Committee that under the heading of meteorology considerable savings could be effected. In view of the vital importance to aviation of meteorological services, and its importance, scarcely less vital, to other sections of the community, we do not agree that any great reduction could or should be made. The Committee evidently realise this fact, and wisely suggests that if more extensive meteorological services are required by the Air Force, they should be provided for on Air Ministry votes other than that of civil aviation.

Incidentally, if the suggested Ministry of Defence should materialise, the whole position of civil aviation would have to be very seriously reconsidered. Already under existing conditions the effect of the military mind is being felt in the Civil Aviation department, and there can be not the slightest doubt that under a Ministry of Defence Civil Aviation would stand in grave danger of becoming entirely overshadowed by the military side. This could not be tolerated for a moment, and it is well that this fact should be kept in mind when discussing the pros and cons of the suggested Ministry. Civil Aviation would have to be entirely separated from the influence of such a Ministry, except in such matters as affected the framing of arrangements for co-operation in case of war.

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The Air Conference

Now that the Air Conference is closed, it is possible to begin to form an opinion of its possible value. The papers read were of a very instructive character, both those of a technical nature and the papers dealing with general matters of policy. One fact was most startlingly brought out, *i.e.*, the divergence of opinion that exists between the views of the Secretary of State for Air and those of more than 90 per cent. of the speakers. Capt. Guest's views, at any rate as he expressed them at the Conference, are so pessimistic in regard to Civil Aviation that they strongly emphasise the need for separating entirely civil aviation from the military side of flying. It was most unfortunate that the Secretary of State for Air should have chosen the Conference as a suitable place for airing such views, as there is always the danger that some of those attending the Conference—those interested in but not in close touch with commercial aviation—may have come away with the idea that Capt. Guest voiced the general opinion. This, of course, is far from being the case, and the many outspoken criticisms levelled at his pessimistic statements must have served to convince the majority that the general considered opinion was not in agreement with that of Capt. Guest. Nevertheless, it is to be regretted that at a time when Civil Aviation is straining to obtain the interest of the great industries that will help to make aviation a commercial success, a Minister of the Crown should have thought fit to do his best to damn the cause of aviation with faint praise. As one speaker suggested, it would appear that we have an Air Minister who does not believe in aviation.

For the rest, the Conference may have done a certain amount of good, inasmuch as it allowed aviation subjects to be discussed on a much larger scale than can be done at the Royal Aeronautical Society. Otherwise one heard exactly the same speakers talking upon the same subjects in exactly the same manner as one can hear at almost any of the meetings of the R.Ae.S. From the other side, the industries and organisations which are, one hopes, going to make use of aviation, one heard nothing or practically nothing. The reasons are, perhaps, not far to seek. From the list of acceptances issued by the Air Ministry one gathered that a fair number of representatives of the "other side" were present, but they added but little to the general discussion. This may be understood if one looks the matter squarely in the face and admits that we—the aviation world—have to a great extent ourselves to blame. Instead of enlarging upon what we can do at present, and are absolutely ready to do, we appear to be divided among ourselves and to have a tendency to finish up every other sentence with "but tomorrow we shall be able to do very much better." The business man is not interested in what we can do tomorrow; what he wants to know is what we can do for him today, and at what price. If we spent a little more time, at these Air Conferences, in stating clearly, and considerably more briefly than was done this year, what we are prepared to do, and leave the discussion of wood *v.* metal, high-lift *v.* high-speed wings, the Diesel engine of some-day-after-tomorrow *v.* the petrol engine of today, etc., to be thrashed out in our own private camps, we might interest those for whom we shall have to cater, quite apart from presenting a somewhat more dignified appearance to the outside world.

Matters of commercial and general policy, and of our aeronautical relations with other nations, are, to our mind, the appropriate subjects for such a Conference, and that is why we press for making them more international in character. Commercial aviation will of necessity be of an increasingly International nature, and the sooner we get together the various nations interested the sooner shall we be able to formulate, with some degree of certainty, policies having due regard to the requirements of other countries and their claims upon recognition.

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One Resting-Place for Lafayette F.C.

AN echo of the tragedy of the late War is the bringing into one burying-ground in France the Americans who fell fighting whilst with the famous Lafayette Flying Corps. According to the *Pall Mall Gazette*, the French Government have decided to provide a plot and arrange for the reinterment of the bodies of more than forty heroes who lie buried in different parts of Europe.

The maintenance of the graves and the erection of headstones will be undertaken by survivors of the famous corps. Of the 186 members of the Lafayette Flying Corps who went to the front, 63 were killed. The bodies of six of these have not been recovered.

Among the bodies to be placed in the new cemetery, which is situated near Souain, is one recovered on the shores of the North Sea, one in Salonika, and one in Genoa.

The cemetery will not be military in character, but will be as simple as an American country graveyard.

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THE AIR CONFERENCE, 1922

[LAST week we published a *résumé* of the paper read before the second Air Conference by Lord Gorell, Under-Secretary of State for Air. This week we continue with extracts from a most instructive paper read by Lieut.-Col. W. A. Bristow, entitled "Aerial Transport, Today and Tomorrow," and with a brief report of the discussions of the two papers. Col. Bristow's paper may appear pessimistic to some, but it cannot be denied that all is not well with civil aviation, and the sooner we realise, and admit, its shortcomings, the sooner shall we be in a position to remedy them. We therefore make no apologies for publishing extensive extracts from a paper in which some strong opinions are very frankly and very ably expressed.—ED.]

AERIAL TRANSPORT, TODAY AND TOMORROW

By Lieut.-Col. W. A. BRISTOW, M.I.E.E., M.I.A.E., F.R.Ae.S.

IT is a matter of some little difficulty to write in a practical manner of the future of aerial transport owing to the lack of sufficient data upon which arguments can be based or from which conclusions may safely be drawn, and in consequence our ideas of the future must to some extent be founded on a mixed basis of theory, practice and imagination. It is impossible, for example, to give schedules of operating costs that could be taken as a guide to the future, as no company in the world has yet run with a complete fleet of aeroplanes and engines such as are considered today to be satisfactory for the purpose, neither can we consider that many other important factors are in a satisfactory condition. It is probably a fair statement that commercial aviation has, up to the present, been little more than full scale experiment with apparatus largely of a makeshift and temporary character. In spite of these limitations, however, the results have been of an extremely interesting and valuable character, and it will doubtless be agreed that the very greatest credit is due to those who have, in face of serious difficulties, carried ever-increasing loads with factors of regularity and safety of a high order.

Before attempting to deal with the subject in detail, it may be as well to examine briefly some of the main outstanding features of the present situation. In the first place, we have to recognise that at present it is not possible to carry on the business without a subsidy in some form or other, and therefore the character, allocation and working of the subsidy system will have a most important effect on development. It has been said that it is a mistake to confine the operations of subsidised services to the London-Paris route, and that there are many other routes which are capable of yielding equally good results.

As a result, however, of close pratical acquaintanceship with the working of several of the present air lines, I am convinced that a better route could not have been chosen, and that it possesses inherent advantages not to be found elsewhere. In the first place, it is about the right length for severity of test, the wide strip of water necessitates a high standard of reliability, and the rapidly fluctuating weather conditions along the whole route absolutely compel the rapid development of the two great guardian services of aviation—namely, meteorology and wireless telegraphy and telephony. In addition, the two termini and the general operations on the route are controlled by different countries with different ideas and methods, and no doubt much of the progress that has been made is due to the mutually instructive effect obtained by such an arrangement. Regarded as an experimental laboratory for the instruction of designers, constructors and operators, an international route is almost bound to be of far greater value than any purely national one.

From a commercial standpoint also, the London-Paris route has very great advantages. The actual journey by land and water, with its changes, delays and vexatious examinations, is rendered far more troublesome than its mere length would indicate, and very few people who have experienced the convenience and speed that can be obtained on this route in any reasonably suitable aeroplane will feel inclined to revert to the old means of travel. Further, the number of potential passengers is enormous, and, in addition to the subjects of the two countries, there are the scores of thousands of travellers and visitors from every country in the world who yearly pass between the two capitals. Many of these gain their first experience of air travel between London and Paris, and it is highly probable that they would not have the opportunity of obtaining it elsewhere.

There are, of course, hundreds of routes within the Empire that could be opened up to air traffic with advantage, but it is considered that success in these will be best assured by first hammering out the many technical and commercial difficulties on our own doorstep, and the Paris-London route, for the various reasons given, is, in the author's opinion, specially suitable for this purpose.

The question that next arises is as to whom the subsidy should be given, and the decision to increase the number of firms on the London-Paris route from two to three has been somewhat criticised.

What are the objects in view for which the subsidy is granted? As I see them, their order is, firstly, to promote and encourage British aerial transport undertakings in order that they shall be enabled to put up a good fight against the very powerful and heavily subsidised competition of the French, and secondly, to help us keep in existence some of the very valuable designing and constructional staffs we had in 1918. But behind all this is the real and vital question of the value of a commercial aviation industry in connection with the defences of the country. Progress in flying generally, and especially in connection with the design of machines and engines, depends largely upon actual flying experience, and already we see most of the flying all over the world being done by commercial aircraft.

It is hardly possible that the profession of aeronautical engineering can be built up on the requirements of military aircraft alone, so that it may well be that the future superiority of our naval and military air fleets will depend mainly upon the growth of commercial aviation, although the actual difference between civil and military aircraft may be as great as that between a "Hood" and a "Mauretania."

The nation is beginning to realise that our position as a naval and military power is undergoing a radical change, and that without adequate air power we cannot expect to maintain the Empire. France and Germany both realise this, and at the moment the French are actively staking out their claims on every airway of importance on a vast field bounded by Brussels, London, Africa and Constantinople, whilst Germany is concentrating on research and experiment on a most extensive scale. Once the latter is free to establish air fleets for service abroad, she will undoubtedly make strenuous efforts to become the greatest air power in Europe, if not in the world. We cannot disguise the fact that technically and geographically Germany is in the strongest possible position for accomplishing this purpose, and we undoubtedly must think of the day when German air lines will radiate from Berlin over the whole of Europe, and probably a part of Asia in addition. Already one of the largest firms of aircraft manufacturers in Germany has concluded an agreement with the Russian Government whereby they jointly run a very large factory in St. Petersburg and halve the profits.

Germany knows and France knows that the future history of Europe will depend to a very considerable extent on the distribution of aerial power, and if we are to retain anything like our present position it is absolutely imperative that we develop our commercial air fleets by every means at our disposal. Cutting down our expenditure on the Air Force and Commercial Aviation may render possible some trifling reduction in the income tax, but that will be of little comfort if, as a result of the next war, the income itself disappears.

This is rather a long digression, but it all relates to the question of the number of firms to be subsidised, and I think you will agree that all the objects in view will be furthered by the addition of suitable firms to the list of operating companies. It is not meant, of course, that such expansion of numbers can be continued indefinitely or that anybody should receive the subsidy. I feel sure, however, that we need have little fear but that British aviation on the London-Paris services will be worthily represented this year by the firms chosen, and that the policy of adding to the number operating is sound and in the best interests of all concerned.

The Air Ministry having provided very largely the ways and means, it now remains with the operating companies to examine carefully the results of past operations with a view to devising means for a more successful solution of the many problems to be solved before commercial aviation can be regarded as a permanent item in our social and industrial life.

The first item that has to be recognised (in fact it does not wait to be recognised) is the impossibility of at present making anything but a financial loss from the operation of commercial aircraft, although on paper it can be shown with comparative ease that the conveyance of passengers and goods by air can be attended with the happiest financial results, even without the assistance of a subsidy. In practice, however, it works out very differently, and operating companies are usually to be found, pruning-knife in hand, attacking every form of expenditure in order, not that the profit may be increased, but that the losses may be reduced.

What then must be accomplished in order that a heavy loss can be converted into a profit, and moreover with such a reasonable certainty as will from time to time ensure the supply of such new capital as will allow the industry to be properly maintained and expanded? The whole future of the aircraft industry, the aerial transport companies, our national defence, and even the future of the Empire may depend upon our ability to answer this question correctly, and it may be as well at once to examine the various means proposed as an amelioration of the present position.

Since the first days of air transport, it has been apparent that the very heavy interest and depreciation charges in respect to the fleet can only be met by keeping the machines constantly in the air with paying loads. This year it has been reported that we are to see an aeroplane doing three or four London-Paris trips in a single day. It is not seen, however, that this will solve the problem. If, for example, two machines are worked on a schedule that keeps them going all day, it will only be possible to maintain the necessary regularity and all the operational advantages that are allied to regularity by maintaining at least one spare machine on each side. A 100 per cent. reserve fleet would theoretically always be idle, and it would seem, therefore, to be just as economical to work the four machines on half time. And, in any case, in several months of the year, weather and lack of light prevent more than one journey per machine per day, or two at the most.

Designers and constructors of aircraft and aircraft engines approach the subject from another standpoint, and are bending their energies to effect improvements which have for their object an increase of the paying load in relation to the fuel consumed, and the cost of maintenance and operation. Such work is of the utmost importance, and progress will be vitally affected by the degree of success that is achieved in these directions. It is clearly impossible, however, to wipe out all the loss by improvements in thermal and aerodynamic efficiencies. Engines already closely approach the limit of thermal efficiency, and he would be a bold designer who would gurantee actually to produce aeroplanes even 15 per cent. more efficient than the best of those existing today. I see no immediate hope, therefore, that the work of the aircraft designer will enable the loss to be turned into a profit.

If civil aviation, therefore, is to have any future, what *is* required? In the author's opinion there is only one answer—Passengers and yet more passengers. Given even a moderate percentage of the travelling public, civil aviation, it is considered, could be made to pay its own way within the next five or six years. It is true that last year showed a welcome increase, and that this year may see a still further advance in the total number of passengers carried, but as the excess will be shared by some seven or eight companies, it is extremely doubtful if the nett increase per company will be anything material.

The regular and safe transport of passengers by air demands a highly skilled staff, but in addition to the overhaul and maintenance staff, which will have to be increased as the number of passengers increases, although not in the same proportion, there are those engaged in the management and operation of the commercial side of the business and also those responsible for superintending the actual working of the fleet, What other class of transport company could afford to keep a staff of such proportions for less than 50 passengers per week, taken as an average over a whole year? In some undertakings, the total number of persons employed in the working of the fleet is greater than the weekly average of passengers carried. No other form of transport could live for long under such conditions, however efficient their vehicles or methods.

It is very difficult at this early stage to form any exact opinion as to the minimum number of passengers that should be carried per week. Incidentally, the aerial week will probably have to consist of seven days as in every other transport undertaking. To cease work on Sundays, in addition to inconveniencing the public and delaying the expansion of the business, causes a loss of 14½ per cent. per year on the working time, thus further raising the cost per flying hour. On the basis of a week of seven days, the author has formed the opinion that the minimum number of passengers necessary weekly for the profitable operation of any one company is not less than about five hundred, and these must be carried in the most efficient machines operated by an exceedingly skilled and highly organised personnel.

By what means then are we to attract the far greater number of passengers required? It cannot be said, at present, that there is any real concerted effort being made by the companies to attract the public. Much of the advertising and propaganda is aimed at securing as large a share as possible of the numbers already travelling, and but little, if any, to encourage the general use of the airway. Before we can answer the question as to how the increase is to be obtained, it will be necessary to try and form some idea as to the main reasons that keep the public back.

It is considered that the chief reason lies almost wholly in the fact that insufficient attention has been concentrated upon the problem of making flying really safe, and secondly, we have not made it look and feel as safe as it is. We are rather apt to think that the public know little of the factors determining safety in flight, and that to them all aeroplanes are very much alike. Experience has shown this idea to be completely erroneous. The author has heard many conversations that show the contrary to be the case, and on more than one occasion has witnessed passengers refusing to travel on a machine which they did not consider either safe or sufficiently comfortable.

Factors Affecting Safety

Pilots.—The experience of last year has revealed several points that require serious attention, even although the number of fatalities and injuries was low, and in the case of the British Cross-Channel Services was actually *nil*. As, however, all companies have to suffer if anything impairs the confidence of the public, it is necessary to survey the European services generally. Probably the most serious cause of accidents has been lack of skill and judgment on the part of the pilots, although it is necessary at once to except British pilots from this generalisation. Our own pilots have, on the contrary, proved themselves over and over again to be exceptionally skilled and resourceful pilots and navigators, and it is impossible to praise their work too highly.

On the Continent and in America, however, there is considerable room for improvement, not only in the actual flying methods, but in the qualifications deemed necessary by the operating companies for pilots that are to be entrusted with passengers to be taken on long and difficult routes. It is considered by many that the question of the training of suitable pilots is one calling for the most serious attention by all those concerned with the control and operation of commercial aerial transport.

Aeroplanes.—It is, of course, highly desirable to design aeroplanes capable of carrying the maximum possible useful load for a given horse-power, which will be capable of being operated at a high speed with a minimum consumption of petrol and oil. It is impossible, however, to attain these ideals to their fullest extent and at the same time preserve the same factor of general safety, and if passengers, because it is not sufficiently safe, will not come forward in sufficient numbers to make the business pay, then the possession of the most money-saving aeroplane in the world does not place the owner in a very much better position.

Is it too much to ask that all aeroplanes used on, say, the London-Paris service, should be able to land and pull up with absolute safety almost anywhere in the country *en route*? If this cannot be done, then are we not bound to conclude that aerial transport is inherently much more dangerous than transport by land and sea? How much is it that would have to be sacrificed in order to render machines capable of taking off quickly and landing safely and providing them with stronger under-carriages, with much greater shock-absorbing capacity, and capable of being brought to rest within 60 yards after touching the ground?

It would have an immensely reassuring effect on the public mind if they knew that before a commercial aeroplane could receive a certificate of airworthiness, it had to make, say, ten forced landings on a given route immediately upon receiving wireless instructions from the ground, and at moments selected entirely by the wireless operator.

Aerodromes.—Sufficient attention has not yet been given in any country to the perfecting of the aerodromes in use. Even at Croydon and Le Bourget there are obvious improvements called for, but for some reason or another time drags on without the defects being remedied. There are few aerodromes in which it is possible to take-off with equal

safety in any direction ; it certainly is not the case at the two aerodromes just mentioned, and it appears almost easier nowadays to tear down a dynasty than half a dozen poplar trees. Further, there is not a single public aerodrome properly equipped with apparatus by which loaded aeroplanes can be readily weighed or the position of their centre of gravity determined, and it is nothing short of remarkable that more accidents do not occur as the results of ignorance as to these two vital factors.

Meteorology and Wireless Services.—Experience shows these two services to be the twin guardians of safety in the highest possible degree. Times innumerable, machines have been saved from danger by timely warning by wireless telephone of sudden changes in the weather conditions, apart from which in a very large number of cases, it would not be possible to undertake the journeys at all if it were not for the meteorological information transmitted by wireless beforehand. During the past year the departments responsible for this work have made rapid strides towards perfecting their organisation. The services also of the Marconi Company and the constant work of their able staff on the development of wireless telephony has been of the very greatest value, and the improvements that have been made are of a most substantial and gratifying nature.

Any suggestions that have been made for the improvement of these two departments are generally concerned with a possible subdivision of the work in the wireless department. At present there is no wireless operator acting solely as watcher and guide to the machines in the air. At one moment an operator may be talking to a machine, and then for fifteen minutes or more he may be engaged on transmitting or receiving weather reports or writing out messages. It is considered that the work should be divided, and one or two operators should do nothing but talk to machines in the air, keeping them posted all the time on weather conditions and other necessary information, giving them a bearing even in fine weather, and in effect helping the machines with all the meteorological and other information that becomes available as their journeys proceed. In view of the expected increase in traffic next year, this question assumes a very real importance.

In the Meteorological Department one could sometimes wish for a little greater promptitude in the reports, and especially with the reports from French stations. On many occasions machines have had to leave this side only very scantily informed of the weather conditions existing over long stretches of the route in France, and in some cases with no information except some several hours old. As a result passengers have been landed in all sorts of out-of-the-way places. It is considered by the author that the safest policy is not to send passengers off unless and until complete reports are available showing a safe route for navigation along its entire length, but this obvious desideratum cannot, of course, be obtained unless the meteorological and wireless departments on both sides of the Channel are working at 100 per cent. efficiency.

Greater Apparent Safety.—At present aeroplanes often do not look and sound as safe as they actually are. The average man in the street taking to the air for the first time is often rendered extremely nervous by the unmuffled roar from engines giving hundreds of horse-power. Most passengers complain of deafness after a flight and also of not being able to talk, except with the greatest difficulty, when *en route*. There are at least two proved types of efficient silencer available, which are easy to fit and low in cost, and it is hoped that this year may witness their general adoption.

Pilots should as far as possible avoid any sudden alteration in position of the machine, and should also abstain from unnecessarily sharp turns involving undue banking. A careful and considerate pilot can do much towards establishing the confidence of his passengers. Many of them do not like being seated in or near the line of the propellers in twin-engined machines. It may be quite all right, but it does not look safe, and many passengers also do not feel safe when sitting facing the tail of the machine. It is considered that every effort should be made to sit all the passengers facing forward with sufficient leg-room, comfortable chairs and a clear outlook.

Comfort.—In addition to the problem of increasing the safety and the apparent safety of flight, there is the added difficulty of providing a machine that can favourably compare with other forms of transport in the matter of comfort. Most passenger cabins are either too hot or too cold, and there does not appear to have been any serious endeavour to arrange for a sufficiency of fresh air without draughts.

Lieut.-Col. C. B. Heald, C.B.E., Medical Adviser, and Wing-Comdr. Beatty, C.B.E., A.F.C., Deputy Controller, Department of Civil Aviation, Air Ministry, have carried out some very valuable experimental work in connection with the ventilation of aircraft, and with the data now available there is little excuse for the continuance of the discomfort and illness that has been caused in the past through inattention to these important questions. In machines fitted with water-cooled engines it should be a comparatively simple matter to fit specially light hot-water radiators in the cabins in parallel with the main engine cooling circuit, and with air-cooled engines a portion of the cooling air flow, not the exhaust, could be passed through light tubes.

Luggage.—The difficulties in dealing with passengers' luggage have also to be surmounted before the travelling public can be diverted from the railways in the necessary numbers. In the past about 30 lbs. weight has been allowed for free luggage, but, as can easily be seen by watching the departure of the boat trains, there are only a relatively small proportion of passengers whose luggage does not exceed this weight. There is also the difficulty with regard to the size of the packages that can be taken. There is sometimes plenty of room in the *fuselage*, but the doorway is too small. All these things may seem very trivial to the makers of the machines, but the inconvenience caused to the public and the operating companies is enormous. The author is of the opinion that the maximum weight of free luggage allowable must be raised, that the charge for excess luggage must be reduced, and that companies shall not part a traveller from his baggage.

Landings en route.—Another serious source of inconvenience to passengers is the delay that arises if they should be unfortunately landed anywhere else but at an aerodrome at which a Customs officer is stationed. First the pilot must find a constable, who on arrival in effect arrests all the passengers and conveys them to the nearest police station, perhaps several miles away. Here they are put through their paces by the Superintendent, who then retires to consult his numerous notices and regulations in order to see the next move. He then proceeds to impound all the passports and send for the nearest Customs officer, which may involve a hunt through all the hotels for miles around. After he has been found and has conducted his examination, passengers are free to proceed to the nearest main line and catch a train, if there is one left, but without their passports, which remain at the police station, from whence they are sent to some authority in London.

This actual case is recommended to the notice of the authorities in the hope that something can be done to reduce the delay and inconvenience that so often accompanies what is obviously a perfectly *bona fide* forced landing of a well-known machine and pilot. The remedy is in the hands of many. Firstly, it is essential that we procure international co-operation with a view to improving the system of reporting the weather *en route*. It ought to be made impossible for pilots to have to land at all sorts of out-of-the-way places because of unforeseen weather conditions, and if bad weather comes up suddenly they should be warned by wireless in time to enable them to retrace their steps to the nearest aerodrome. Designers also should sit down deliberately to design a bad-weather aeroplane in which the probability of arrival at the proper destination is as great as in the case of, let us say, an Atlantic liner. Much improvement could be made if the principle involved were adopted. In such a machine, for example, amongst other important features, great care would be devoted to the position of the compass and the wireless equipment, as a full and proper use of these has a most important bearing on the subject.

Further, the operating companies themselves are divided into two distinct camps. There are those who consider that the public must have reliability, and that this means reliability of departure ; the other school of thought believes that reliability involves reliability of arrival, even though it may involve gaps in the programme of start. It will probably be found that the business as a whole will best be encouraged by adopting the alternative policy.

Cost of Travelling by Air.—The old price for a ticket to Paris was £10, and when the fare was reduced to £6 the number of passengers increased very considerably.

The question that naturally arises is, can the required volume of traffic be obtained whilst the fare is so much higher than that charged by train and boat ? The standard reply is that the difference between the first-class fare and the price charged is only small, but is this a fair way of looking at the question ? Considering that much of the aeroplane accommodation has been only fourth class (and that flatters some machines), it would appear to be a wrong basis for comparison. If the companies believe they will obtain their full volume of passengers from the rich there is

nothing more to be said, but if it is agreed that an aggregate of two or three thousand passengers weekly are required, then it seems inevitable that the fare will have to be adjusted to meet competition, and the hitherto despised second-class passenger will have to be catered for.

Very few people seem to know that a return ticket to Paris can be procured for less than £3. The author is of opinion that the single fare from London to Paris by air will have to be reduced to £4 before the necessary increase of passengers can be obtained. The time may not be ripe for this reduction, as it is doubtful if the British machines available this summer will be sufficient to deal with a very large increase of passengers, but it is considered that at least by 1923 the question will have to be very seriously considered.

Educational.—In the foregoing notes it has been assumed that there are already a sufficient number of people willing to travel by air providing it is made perfectly obvious to them that their safety and comfort are assured. This assumption, may, however, be incorrect, and it is possible that if the views of the bulk of the cross-Channel travellers were taken it would be found that in the great majority of cases they would refuse to travel by air in any circumstances whatever. It may be, therefore, that at present there would not be sufficient passengers even if the fares were the same, and if this be the case some form of general educational propaganda is a vital necessity if the needs of the future are to be met. In any case it is probably a necessity, and if the tube railways of London still find it necessary to spend large sums yearly in order to attract more passengers to the underground system of travel, how much more essential must it be to undertake a similar campaign in respect of travelling at about three thousand feet over ground and without any visible means of support!

A whole paper could be written on this subject, but a few words will suffice to give some idea of what such a policy of education and propaganda might entail. (*a*) The history of flying, the development of commercial aerial transport and the engineering and scientific aspect of flight should be part of the curriculum in every school in the country, so that the rising generation may be taught to regard air travel not as a romantic novelty, but as one of the sober facts of life. (*b*) The cinema should be much more extensively employed for the purpose of keeping the public informed of the possibilities of air travel. (*c*) The Press, who already carry on such excellent work, could render it even more valuable by publishing statistics as to the high standard of safety and reliability already attained, and occasionally affording some of their space to the rather more practical side of commercial aviation. (*d*) Joy-riding concerns should be encouraged as much as possible, and approved firms might even be given a small subsidy in some form or another.

The author suggests that this is eminently a case for the consideration of the Society of British Aircraft Constructors who might form a small committee including representatives of other interested bodies, the object of which would be to devise and actually carry into effect some sort of general educational work.

Life Assurance Policies.—Last, but by no means least, assurance companies should be persuaded to allow ordinary flying under the terms of their standard life and accident policies. Is it likely that people who have paid premiums for years are going to travel by a route on which their policies would be null and void in the event of their death, especially if they have real dependants? Further, it is a very bad advertisement for civil aviation when almost every life and accident policy in the country places a complete ban on flying. The general removal of this restriction will mark a red-letter day in the history of flying, and it will become certainly an important, if not the most important, date in civil aviation, and no effort should be spared in endeavouring to procure this vitally necessary reform.

Conclusion.—This Conference comes at a most critical period alike for the country and for commercial aviation. In view of the vital importance of commercial aviation and its relation to air power, it is lamentable in the extreme that, in this year, the fourth after the Great War, the British Commercial Air Fleet should consist all told of less than twenty aeroplanes.

The British Empire embraces close upon 13 million square miles of territory, and has a population of 440 millions. In the development of the various parts of the Empire and in the interlocking of the whole, the question of transport and communication is of fundamental importance, and it is greatly to be regretted that the public here are not more fully aware of the importance with which the matter is regarded in other parts of the Dominions. For example, take Canada—the latest Canadian Air Board report clearly indicates that much of the work in connection with the development and protection of the country is being completely revolutionised by the use of aircraft, and that every day aircraft are engaged in forestry reconnaissance, photography, fire prevention, exploration, communication, transportation, and for many other purposes with the most remarkable results.

The United States with one-fifth the population of the British Empire, and of less than a quarter of the area has a railway mileage of 251,984, as against 134,131 miles in the British Empire. Not only that, but the narrowness of our tunnels and the weakness of our bridges so hampers the development of our locomotives and rolling stock that we are compelled to operate on a very low level of efficiency, with the result that today we see trades being forced on to the roads in their frantic endeavours to save their business from disaster. The neglect of other means of transport in our waterways costs this country millions of pounds yearly. Is the history of British Commercial Aviation to proceed along these dismal lines? Are we to see French and German machines all over Europe and running as far out as our interests in the East? Are we going to take a short-sighted view of the technical needs of the situation as the railways have done, so that we are handicapped from the very start?

In these notes stress has been laid upon the fact that commercial aviation should be able to stand by itself financially, and there is no doubt that if we can make it so our chances of supremacy will be improved, but, profit or no profit, other countries are not going to allow the business to fade away. The London-Paris service has been of the greatest value in showing us what to do and what not to do, but the situation urgently demands that we ask ourselves today—what is our real programme and what is the next step? Are we prepared to face the opening of 1923 with a total fleet of about twenty machines, or one for each 600,000 square miles in the Empire? The position is serious in the extreme, and what should be a big concerted national effort is left to a small group of enthusiasts in the Air Ministry and in the industry.

What we want are, firstly, funds and a revised policy for research and experiment in connection with the problems associated with the development of civil aviation, and as a temporary measure, we want a large number of engines and machines ordered tomorrow of the very latest types. We also require an establishment for the training or re-training of commercial pilots, and such training must be of a far more comprehensive character than it was possible to give during the War. Our present position, with about a dozen first-class pilots in training, is almost ridiculous, especially when we consider that four years ago we had about 20,000 pilots, and 35,000 engines were turned over to the Disposal Board.

For months past we have been giving unemployment pay to thousands of skilled workers in the late aircraft industry. Is it impossible to put these men to work on manufacturing machines and engines? I am told that in many grades there is little difference between employment and unemployment pay, and if this is true, it seems absurd to keep on paying away hundreds of thousands of pounds to idle men whilst an industry that is vital to our very existence as a first-class power is allowed for want of orders to languish to the point of extinction. As business men, we do not need reminding that it is imperative that the national expenditure be reduced, but being business men we also know that much of the money that has been spent since the War could have been most advantageously expended in other directions, and that a small portion only would have enabled the aircraft industry to be kept alive and civil aviation to be placed upon a much broader and more efficient basis.

During the War we utilised our materials to the fullest possible advantage by establishing a system of priority. Money is the raw material of peace, and if we are to husband our resources and yet achieve the maximum possible progress we must have a properly thought-out system of priority in expenditure. At present, incredible as it may appear, there is no such system.

It is the duty of the Government, the Air Ministry, and the aircraft industry mutually to co-operate with goodwill on a bold and militant policy that will secure for the country and the Empire the great and material benefits that most surely will follow upon the establishment of a British aerial transport industry on a wide and sound basis. Neglect of this opportunity will involve us in consequences of the most disastrous description, and although we cannot pretend to see the full measure of the cost, we at least can see that our position in Europe and the integrity of the Empire would be most gravely imperilled.

Appendix

This is not a technical paper, and the author has endeavoured as far as possible to abstain from dealing with matters that may form part of the subject of technical papers. It is desired, however, to draw attention to two matters which, although of a technical nature, have in addition a most important bearing on the commercial side of the business and which call for most serious attention. I allude firstly to the problem of getting aeroplanes into the air and landing them, and secondly to the many questions relating to the supply of fuel. The first calls for very considerable research and experiment, and the second for a clearer vision of the objects in view and more effective co-operation between the various parties concerned.

Getting-off and Landing.—An aeroplane, in addition to operating in its normal medium, must first haul itself up to its operating level, a process which is much more difficult than normal flying, and which necessitates a much less advantageous form of vehicle. It is as if a locomotive, before commencing its journey, had to haul the train out of a field and up a stiff gradient before it could get on to the rails and proceed on its journey. With the ordinary type of wing in use today a loading of about 10 lbs. per sq. ft., is accepted as about the maximum possible, but if this difficulty of getting up and down again did not exist machines could operate quite safely with a wing loading of 20 lbs. to the sq. ft., or alternatively, if it were only a question of level flight, the power unit could be cut down to something like half its present output. These twin operations of getting off and landing also account for nearly all the accidents that occur, and the high cost of insurance is entirely due to the dangers attending these operations. Here then is a problem that calls for the most urgent attention; its solution is vital to the progress of commercial aviation and also to the successful development of two very important classes of naval and military aircraft.

It is possible to help matters to some extent so far as getting-off is concerned by so designing the propeller that a greater proportion of the full power of the engine is available on the ground, and which is also more effective in producing thrust at the getting-off speed. It is, of course, also better for the engines when on full throttle to run at speeds more closely approximating to the full load speeds for which they were designed.

The Petrol Position.—Let it be assumed that in the most efficient aeroplane existing a given load can be carried from London to Paris at a cost for petrol of 100 shillings. It will not be a very large load; that is immaterial. By improvements in design of the structure based upon long and painstaking work in the wind tunnel and full scale experiments, we may succeed in another few years in so cutting down the resistance that our expenditure on petrol may drop to 80 shillings; in addition we may increase the working thermal efficiency of our engines by as much as 10 per cent. These improvements will reduce the cost of the petrol consumed on our hypothetical journey from 100 shillings to 72 shillings, and represents what would be a very considerable over-all gain. But if the price of petrol were reduced to 1*s.* 9*d.* per gallon, this 28 per cent. saving could be effected today, and thus by a stroke of the pen the whole aviation industry could be placed in the same position that otherwise will only be attained after years of effort.

Everybody connected with aerial transport has been making sacrifices of one sort or another in order that the business may be developed. As far as I know, however, the petrol companies themselves have made no similar sacrifices, but on the contrary have made a handsome profit out of the very large needs of an industry of supreme national importance struggling for its very existence. I do not wish to do the companies any injustice, it may be that they make only a fair and reasonable profit on aviation spirit, but I do ask them to consider whether they cannot give a special rebate on petrol for commercial aviation for the next three years, even if it involves giving up their profit on this particular portion of their sales. If commercial aviation ultimately fades away, the petrol companies will lose what would have been an exceptionally good market, and will have themselves largely to blame for the loss.

As this is a matter of very considerable importance, it is proposed to examine this question in detail. In the first place it is essential that aircraft shall be fitted with accurate and easily read petrol gauges, or, better still, with flowmeters in addition, by which the consumption can be checked from point to point and at any moment. A mere examination of the figures of over-all consumption is insufficient; it is essential to know how, when and where the fuel is being consumed at every stage of the operations. Having fitted suitable gauges, which incidentally must indicate correctly both in the air and at rest with the tail skid on the ground, the next step is to inaugurate a petrol log-book for each machine in which a complete stage-to-stage record is kept.

The first thing that will probably be observed is that the engines are using more in actual flight than would have been expected from a study of the test bed consumption figures. Some of the causes of this cannot easily be remedied, but some economy can be effected. It will often be found the carburettors are at fault. It is easy enough to set a carburettor on a test bench so that the mixture never errs in the slightest degree on the rich side, but the engine is there always at one level, it is not bumped about, and even if it were occasionally starved somewhat on being opened out, it would not matter. But the ground engineer has a totally different proposition before him, and if the regulation of the mixture is in his hands he is always bound in the interests of safety to err on the rich side.

At some period in the development of aero engines, somebody invented the term "altitude control" for the fuel economiser. The result was that commercial pilots formed the idea that it was a device that did not interest them, as they never flew at any altitude worth considering. For commercial machines it should have been termed the petrol economiser, and every effort should have been made to induce pilots to use it to the uttermost capacity.

In my opinion, the carburettor for commercial machines should contain two independent means of regulating the supply to the engine. The flow should be through a fixed jet of such capacity that the maximum requirements for getting-off are never prejudiced, and an economiser under the control of the pilot added to the circuit in order that once safely in the air and well warmed up, the petrol could be cut down to the minimum. Further, the economiser should operate in such a manner that in the event of its becoming at all out of adjustment, there would be no chance of the petrol supply becoming strangled. One means of effecting this would be by making the economiser work on the principle of reducing the pressure in the float chamber so that if anything went wrong all that could happen would be a loss of economy until the fault was corrected, but with economisers of the needle valve type it is almost certain that sooner or later trouble will be experienced necessitating a forced landing.

Another and a most important factor in the petrol situation is the wide variation in the quality of the petrol supplied by the various companies. The first requisite is a drastic revision of the basis on which petrol is sold. At the present time there seems to be a conspiracy of silence on the part of petrol companies as to the real value of their fuel for aero engines, and most of the official specifications for petrol are based on false premises, and are entirely useless for all practical purposes. It would perhaps be the simplest course if engine makers published a table showing the maximum compressions that could be used with their engines, according to the different toluene values that could be guaranteed by the petrol supplier.

Thus, supposing a firm were using Lion engines, Messrs. Napier would provide a specification showing the maximum compression ratios possible with fuel of various toluene values giving consumption curves corresponding to the compressions indicated. The chief engineer of the transport company would decide the compression he would wish to adopt after consideration of the special circumstances of his particular service, and then proceed to place a contract for fuel according to the requisite toluene standard. But, and a very important "but," the petrol companies would have to guarantee and actually maintain the standard agreed upon, otherwise there would be trouble of the most serious description.

There are also minor ways of effecting economy. For instance, petrol can be saved by avoiding as far as possible taxying machines under their own power. There is also far too much petrol wasted tuning engines and warming them up before departure. A good ground engineer is worth paying well; if he thoroughly understands his engines and can test accurately and quickly, he will save nearly £10 weekly on petrol alone.

The Discussion

Tuesday, February 7, had been set aside for the discussion of the papers read before the Air Conference on the previous day. Lord Weir, who took the chair during both morning and afternoon sessions, announced that he had been asked to state that the Secretary of State for Air (Capt. Guest) regretted that he was unable to attend, owing to his attendance being required in the House. In opening the discussion, Lord

Weir said that a review of the achievements of the last three years showed very meagre results. He was, he said, intensely pro-aviation, but we had to admit that the aeroplane had been unable to show results compatible with expenditure. In saying this, he would except the cross-Channel services. What was the reason, and should the fact lessen our belief in civil aviation? He was of the opinion that there was absolutely nothing that gave cause for lessening our faith in civil aviation. He pointed out that if one could obtain the balance-sheet of modern machines and that of those three years old one would find great improvement, but that the aeroplane, in spite of this, still carried relatively small commercial loads. Subsidies had enabled us to keep machines flying on the cross-Channel services with fairly good regularity, and with regard to subsidies, he endorsed Lord Gorell's remarks relating to the fallacy of making comparisons with what was being done in other countries. He thought that, for the purpose in view, the present subsidies were sufficient. We must now, he said, ask ourselves the question whether the experience gained on the cross-Channel services justified us in taking the next step in the form of an additional route elsewhere in the Empire. He was of opinion that such a step was justified, and that the logical one was undoubtedly the Cairo-Karachi route. On this, more modern machines were becoming advisable. With regard to the formation of the new C.A.A.B. (Civil Aviation Advisory Board), as chairman of the old Committee, he heartily welcomed the formation of the new, and thought that it should be fruitful of good results. He then called upon General Sir Frederick Sykes, Controller-General of Civil Aviation, to open the discussion.

Sir F. Sykes stated that we are all concerned in laying down the broad principles on which aviation in this country can best be developed. We are, as a nation, poorer by some £14,000,000,000 since 1914, and must practice the strictest economy. There are certain things which we must make up our minds to go without. Is aviation, he said, one of those luxuries which we can afford to forego? He thought the answer must undoubtedly be that it is not. The air, Sir Frederick said, materially helped, if it did not actually win, the last War. Next time it will be the same, but more so. He quoted Mahan as saying "Sea power is based upon a flourishing industry." If, Sir Frederick said, we substitute "air" for "sea," the analogy is still true. The Air Force, by itself, is not air power. Wise generals maintain a reserve of at least three men for every one in the firing line. To maintain an Air Force capable of prolonged resistance, the same ratio as a minimum in pilots, personnel and material is necessary. Peace and commerce, he said, never yet looked well tied to war's chariot, and he pleaded for something greater than a measure of financial support, namely, for freeing Civil Aviation from the blighting incubus of military end-all and be-all, and allow her to go her own way as a peaceful, not unproductive, sister, a child as yet, but in time capable of assisting the fighting arm. Real progress depends on commercial development. Personally, Sir Frederick said, he was convinced that as yet civil aviation cannot fly by itself, that support must be given and is justified, and that we run a grave risk if, for want of support, we allow the aviation industry to fade and die. He would throw this apple into the arena: (1) Is aviation a necessity of our national life, and therefore to be afforded at any cost? (2) Can Service aviation exist without its civil counterpart? (3) How best to develop civil aviation.

Col. Armstrong, President of the Federation of British Industries, said that his federation had had the subject of aviation in mind for some considerable time. The Federation thinks, he said, that aviation can and will be of great service to the community. It seemed to him that the Government looked upon civil aviation too much from the military point of view. He thought it could best be developed on sound commercial lines. With regard to air mails, he thought that the G.P.O. was not as sympathetic as it might be. He was of the opinion that an air mail stamp would help materially in popularising air mails. As regards the carriage of goods, he thought, and quoted figures to prove his opinion, that the amount of goods sent by air was negligible; far more important were passengers and mails. He thought, however, that the London–Paris route was far too short, and did not provide a fair test of the advantages of commercial aviation. Much more might be done by extending services to cities in the United Kingdom, and he looked forward to seeing such services established. He thought that there would be very great advantage in linking up distant parts of the Empire with the Mother country, and pleaded for services to Egypt, India and Africa. As regards expense, although air travel cost more than other means of locomotion, he thought that if a distinct saving in time could be effected, business men would willingly pay at a higher rate for the services rendered, and he thought that services to Egypt, India, Australia etc., would certainly receive great support from passengers.

Brig.-Gen. Sir Sefton Brancker said he was speaking on behalf of the Air League of the British Empire. He criticised the speech of Capt. Guest, and could not agree that it would be many years before air lines in Europe would pay. That, he thought, was a very pessimistic statement. He did not believe in developing civil aviation at the expense of military aviation, and said that already the Service had been cut down to the bone. The R.A.F. was better and more economically run than either of the two other Services. He congratulated the Government on making Palestine an Air Force Command, as that would make for economy. The cross-Channel services were of no value, he thought, except for the purpose of gaining experience, and now was the time to go for Imperial air routes. He did not agree with the policy that the R.A.F. should open air routes. Apparently the impression was, he said, that whereas civil aerodromes cost a lot of money to establish and run, military aerodromes cost nothing. As a matter of fact they cost a great deal more, and the services were of no value in demonstrating the cost of running commercial lines, as the machines were not of commercial types and there were, furthermore, unlimited supplies of them.

With regard to subsidies, he knew that many were opposed to subsidies for aviation. He really did not see why, as other services were subsidised. What about the P. and O. subsidies? he asked. Competition was said to be good for trade, but he did not think that any good purpose was served by competition between British companies. We had, he thought, plenty of competition from France. As regards paying, it was not for the Government to insist that civil aviation should pay at once. The telephones did not pay, but nobody suggested that we should do without telephones. The General then referred to civil aviation as a sort of fifth wheel which, moreover, had been jammed. In 1920 we heard a lot about "all-red routes," blazing the trial and so on. The C. of C.A. was then £300,000 in pocket, but no assistance was given to aviation. Later came a change, and now he thought the subsidies were greater than necessary. He pleaded for the formation of a *national* company so as to avoid competition between British firms.

Gen. F. H. Williamson, C.B.E., representing the General Post Office, gave first a brief summary of what has been done in the matter of air mails. On the London–Paris services there was a distinct gain so long as the morning services were running. Letters were then delivered on the same day. On the London–Amsterdam service there was a very considerable saving in time. The efficiency of this service had been 89 per cent. He also referred to the extensions of the London–Amsterdam route to Bremen, Hamburg and Berlin, and stated that, on the whole, the service was very successful and gave a very considerable saving in time. It was rather significant that Berlin made far greater use of the air mails on this line than did London in the opposite direction. Thus in one month the number of letters transmitted by air from Berlin to London was 2,540, while in the same period only 480 letters were sent in the opposite direction. On the Cairo-Baghdad route a saving in time of from 11 to 18 days was effected, and there was, he said, a gratifying increase in the use of this service. The Belgian services in Belgian Congo saved about 11 days. As regards the future, Gen. Williamson thought that civil aviation was full of promise, although still in its infancy. The Post Office authorities had to consider four things: regularity, cost, distance over which air services were possible and night flying. It was, he said, difficult to foresee what would be the effect of the charges made for conveyance by air. Thus when the air fees were reduced from 2*s.* to 2*d.* the increase might be expected to be enormous; as a matter of fact, the number using the air service only increased 200 per cent. Parcels post by air was very useful and effected a great saving in time. Thus parcels posted from London in the morning were usually delivered in Paris the same evening. Real development would come, he thought, with services over longer distances, and night flying, when it becomes possible, would materially assist. On the subject of the air mail stamp, he thought that, while such a stamp might have a certain amount of advertising value, it would tend to hamper the extensive use of air mail as it would necessitate a special stamp, whereas now one could use the ordinary stamps and post the letter anywhere.

Mr. F. Handley-Page said that he had been somewhat depressed by the remarks made at the opening of the conference by Capt. Guest. It seemed that that gentleman's experience recently on a flight to Paris had been unfortunate,

and he did not, of course, use the regular air lines for his trip. (Laughter.) He would like to associate himself with some, but not all, of Gen. Brancker's remarks. With regard to development, he thought that experience of a useful nature could only be got by actual flying under commercial conditions. He was sorry to see the fashion adopted in some quarters of belittling what had been and was being done by other countries in the matter of civil aviation. Certainly their manner of doing things and their types of machines might not conform to our own pet theories, but much useful work was nevertheless being done, notably in America. He did not think that lines abroad should be established by the R.A.F., but by commercial subsidised lines. Imperial air lines could not, he thought, be expected at once, and to him it seemed that a more likely development was the establishment of smaller local lines throughout the Empire. Later these would link up to form a long-distance Imperial air line. Turning to the question of goods-carrying by air, he pointed out that great reductions had already been found possible, and that this year the charges would be but very little higher than those of the railways.

Sir Samuel Instone said he had been shocked by some of the remarks made by lecturers and by the Secretary of State for Air. He was beginning to wonder, he said, whether he had come to the funeral of civil aviation. He was sorry to hear that Lord Gorell did not think that there was any future for civil aviation in Europe; personally he thought that there was a very good future. He was pleased to learn of the establishment of the new Civil Aviation Advisory Board, but he greatly regretted that the operational companies had not been included, and hoped that it would be found possible to include their representatives on the Board. He had stated at the last Conference, and he would state so again, that civil aviation did not pay, and that subsidies were necessary. Our personnel and machines, etc., were not equalled abroad, and people preferred to travel in British machines. That was a position which we should at all costs strive to maintain. He pointed out that out of a total Vote of £18,000,000, £200,000 was spent on civil aviation, and out of that half was to go to the purchase of machines. One could not, he said, help wondering a little as to how the remaining £17,800,000 was being spent, and he thought that some of it ought to go to civil aviation. The Government attitude reminded him, he said, of a play he saw some years ago entitled "Brewster's Millions." Unless that gentleman could spend his millions he would lose his job. As civil aviation would provide the reserves for the R.A.F., why not give half of the money to civil aviation? Sir Samuel then proceeded to indicate certain economies which, he thought, could be effected elsewhere so as to leave more money for aviation. For instance, he said, are we not outgrowing the use of coast-guards as at present established? There is, on an average, a coast-guard stationed every three miles along our coast, looking out to sea through such an antiquated instrument as a telescope. He thought that the work could be much more efficiently done by amphibian machines, which, when they saw a ship on the horizon, would go out, circle around it and, if necessary, alight by its side. He pleaded for greater use of aviation by the business community, and pointed out that, before establishing an air line, his firm had their own machines and were very frequently able to beat competing firms by being able to get contracts signed long before rival firms could do so who were not using this speedy means of transport. His firm would, he stated, establish an air route to India as soon as the necessary aerodromes were available. Regarding the carriage of newspapers by air, he was pleased to announce, although he would not divulge the name of the paper for fear of giving information to competitors, that he had a contract with a certain well-known newspaper for the carriage of it by air.

Sir Charles Bright thought the general lack of sustained interest was most remarkable in view of the work done by the Royal Aeronautical Society and the Air League. On the question of airships, he was glad the decision to scrap was due to economic reasons only, as he considered the airship specially suitable for long-distance work.

He called attention to the necessity for research if progress was to be sound. He had personally tested the air mails, and regretted to say that three times out of four the ordinary mail beat the air mail. This was due to faults in the terminal connecting links and not to the aircraft themselves. As regards the greater use made by Berlin of the air mail, this he thought was due to the German Government doing more to popularise aviation and the use of air mails. Sir Charles thought that the objections raised by Gen. Williamson to the air mail stamp could easily be got over.

The advantages of using the air would, he pointed out, be greater over long distances, and he pleaded for the establishment of Imperial air lines. For the sake of economy he would suggest that aviation matters should be dealt with by a ministry of transport.

Mr. G. F. Luke said that, as a member of the Federation of British Industries, he would like to associate himself with the views expressed by its President (Col. Armstrong). The success or failure of aerial transport is largely dependent upon the support which industry in this country gives to it. Two of the main sources of revenue of an air transport company should be mails and freight, and he thought it could hardly be disputed that, except for a few devotees, the facilities offered by existing air mail and transport services are unknown to the great majority of industrial Britain. With reference to air mails, he stated that in the provinces the post officials were frequently as ignorant as the inquirer. As regards transport of goods by air, he thought that what was wanted was the inauguration of some system of payment of freight and charges on delivery, so as to avoid the delay that now takes place between the delivery of goods in London and their forwarding to the consignees. By way of an example Mr. Luke took a consignment of goods from Paris to Glasgow. The consignment leaves Paris and is delivered to the transport company's forwarding agent in London on the same day. The latter then writes to the consignee stating that on receipt of the amount of freight and charges the goods will be forwarded. The result is that the consignment takes about 72 hours to do the journey from Paris to Glasgow, whereas on a payment on delivery system it would only take about 24 hours.

Commercial aviation, Mr. Luke said, if it is to pay its way, will require the support of the whole of Great Britain, and not of its Capital only. Canvassing for freight should be undertaken in all the big industrial centres by agents of the air transport companies, and special arrangement should be made with the railway and express companies so that goods destined to be forwarded by air would receive preferential treatment. He thought it was abnormal that our continental services should end at Le Bourget, and that we should be dependent on French lines to carry our passengers, merchandise and mails from there to the four corners of Europe. He suggested that we should attempt to get an agreement with France whereby Le Bourget became an international air port. Similarly with regard to Amsterdam, some such arrangement would facilitate opening up of British air routes to Scandinavia and the Baltic States.

Mr. Luke pointed out the importance of Egypt as an aviation centre, and said that, even if we could not at present afford to establish Imperial air mail lines, we should take steps to ensure that we had a right-of-way over Egypt in the future.

The Chairman (Lord Weir) then read a communication from the Chinese Chargé d'Affairs, in which were outlined the progress made already in that country and the air lines already established (with Vickers-Vimy aeroplanes). China fully realised the possibilities of air transport, and when the time came that British lines ran to her borders she would be ready to link up with them. At present, the communication stated, the Trans-Siberian Railway is out of working order, owing to the conditions in Russia, and it was suggested that aeroplanes might be employed at once to secure a better communication with China until the railway is again running as it used to do.

The Agent-General of Tasmania (Mr. Ashbolt) said that so far all the talk had been about the aeroplane, and he now proposed to say a few words about his pet, the airship. He was sorry to hear Capt. Guest's pessimism, and thought his statements did not and could not represent the British spirit. He repeated that commercial interests are prepared to find money for airship services, and only a reasonable subsidy would be required. The Government organisation of the routes must, however, come first. Technically the airship is ready for commercial work, and the only obstacle is the financial difficulty of ground establishments. He pointed out that in two or three years' time, owing to the general progress made the world over, we shall be forced to take action whether we like it or not. He very much regretted that New Zealand and South Africa had turned down the airship proposition, and if India turned it down also it would seem to be the end of the matter. He had, however, a proposition for establishing airship routes, but it was not one with which he was particularly in love, and he only would suggest its adoption if all else failed. Briefly it was this: that Germany should supply the airships, whose value should be deducted from Germany's war indemnities. It would not, he explained, mean any hardships on British workmen, as if the whole

scheme fell through there would not be any work for airship workers in any case, while if we got the airships there would always be a certain amount of repair work to be done. To summarise, his suggestion was that Germany should be allowed to supply the flying stock. The Air Ministry should supply the necessary stations, and the other costs should be divided between India and Australia.

Col. J. Barrett-Lennard, of Handley Page Transport, Ltd., also spoke of the gloom of Capt. Guest. He did not like to put the question, he said, but one was forced to ask oneself: Is it possible to have an Air Minister who does not believe in aviation? With regard to subsidies, he knew that many thought these were unnecessary. That was not so, and his firm had always lost heavily on their air services. He said they were not grateful to the Air Ministry for their subsidy, as it was a piece of pioneer work which had to have assistance. He also spoke of the competition between British firms, and stated that there was inevitably a duplication of expenses, such as each firm maintaining headquarters, etc., and now it was proposed to add yet a third competitor.

At the closing of the morning session a resolution was moved by Gen. Brancker, on behalf of Mr. Holt Thomas, as follows :—" That, in view of the necessity of increased rapidity of communication within the Empire, and in view of the progress made by other nations in civil aviation, this Conference calls upon the Government to give due and immediate consideration to the foundation of an air mail throughout the Empire." The resolution was agreed to without discussion.

In next week's issue of FLIGHT we hope to be able to publish *résumés* of the technical papers and the discussion of them which took place during the afternoon session.

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LONDON TERMINAL AERODROME

Monday Evening, February 13, 1922

AERIAL passenger traffic is showing a steady upward trend again. Last week no fewer than 98 pasrengers passed through the Customs on the aerodrome, and although this may have been due, in part, to the return of good flying weather, there is little doubt but that the worst of the " slack " season is over.

Arrangements for coping with the increased activity expected within the next few months are proceeding rapidly. The Instone goods' office is completed, and already occupied, and the alterations to their main offices are approaching completion. The whole of the Instone offices are being painted the vivid blue which appears to be a " monopoly " of this air-line.

Grands Express are to erect a passengers' waiting and writing-room alongside their present office. Mr. Bouderie declares that it will be an improvement on anything erected so far on the aerodrome. It is to have a verandah running the whole of its length.

Sites have been marked out for the offices of the Daimler Hire Air Service ; for the Anglo-American Oil Co. ; and also for Messrs. Ogilvie and partners. There will soon be no room left on the main-entrance road for any additional offices.

" The Automatic Pilot "

DEMONSTRATION flights have been made with the Messageries Aériennes' " Goliath," fitted with the Aveline Stabiliser. The device appears to be perfectly satisfactory, and the pilot of the Goliath expressed great faith in it, saying he would have no hesitation in flying in weather such as has, up to now, been considered unfit—provided always that his machine was equipped with this stabiliser. The automatic control corrects movements of the machine, almost before they have become perceptible, while the method of " damping " prevents oscillation, such as might otherwise be set up in the operation of any automatic device.

Another " D.H.18 " has arrived from Martlesham, where it has been undergoing " type " tests. It carries the registration number " G-EAWX." and is practically a replica of the last delivered, having handle-starting and similar cabin fittings.

The Napier-Bristol has been handed over to Handley Page Transport by the Air Ministry, and is having final touches put to it before going on the Paris service.

The Jupiter-Handley is to go to Paris for demonstration there, and, in the meantime, is doing a lot of test-flying.

On Saturday, the Napier-engined Vickers " Vimy," which has been sold to the Grands Express, and which was exhibited at the Paris Aero Show, arrived from Paris, and continued on to Brooklands today. It is understood she is to have slight alterations made there before going on the regular service.

Mr. " Jimmy " James arrived from Paris during the week on the " Sparrow-hawk," and later flew it over to the Gloucestershire Aircraft Co.'s works.

News of the 10,000-miles " Air-Taxyman "

TIDINGS have reached us that Mr. Alan J. Cobham has reached Rome on his 10,000-mile " air-taxi " tour of Europe and Northern Africa. He arrived there on Sunday, just as the Pope was being crowned, and flew round St. Peter's three times during the ceremony. He flew from Morocco to Rome by way of the Sahara, the Garden of Allah, Tunis, and Sicily, passing over Mount Etna and Naples. His next stage is to Athens.

The new hangars on the " operations " side of the aerodrome are nearing completion. The concrete floors have been laid, and the canvas coverings are on. Air Ministry electricians are now fixing the lights, and load after load of ashes are being " tipped " to form firm ground for the machines to " taxi " over.

The electric supply to the " cone " light, which, up to the present has been of a temporary nature, has now been put underground and made permanent.

" Joy-Riding " Begun Again

THE Surrey Flying Services have started " joy-riding " again, and obtained several passengers during the week-end. The Renault-Avro they are erecting for Mr. Derwent Hall Caine is now nearly complete, and, with its coating of aluminium dope, looks very attractive. Captain Muir tells me they are now to put in hand the erection of the " D.H.9's " which his company intend to use as " air-taxis " this year.

One of the Grands Express " Goliaths," which has been named " Verdun," has been equipped with a full set of lights for night-flying. In addition to the cabin lights, there are red and green navigation lights on the wing-tips. Under the *fuselage*, two big headlights have been fixed to throw brilliant beams ahead and slightly downwards. These are to be made movable, so that the pilot can swing them vertically downwards to light up the ground immediately below. Under each lower wing-tip, two Holt landing-flares have been fixed. The current for the lights is supplied by two dynamos, driven by the slipstream. The small propellers on these dynamos are of unusual design, having only one blade, which is balanced by weights. This machine and its lighting equipment are to be tried-out shortly in an actual night flight.

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NOTICES TO AIRMEN

Holland : Work at Rotterdam Aerodrome

WORK is in progress on the southern half of the Rotterdam aerodrome (lat. 51°53'N., long. 4°27'E.). Pilots should, therefore, when possible, land in the northern half of the aerodrome, until further notice. A chimney (height 25 metres = 82 ft.) is also in process of erection behind the hangar, *i.e.*, in the north-east corner. The row of trees along the southern side of the aerodrome will be removed shortly.

(No. 17 of 1922.)

Lympne Aerodrome : Extension of Cloud, Visibility and Weather Signals

1. THE system of ground signals at Lympne aerodrome denoting to pilots the height of clouds, visibility and weather at Biggin Hill and Croydon aerodromes, which was described in Notice to Airmen No. 57 of 1921, will be extended as from February 13, 1922, to include information referring to the aerodrome of St. Inglevert.

2. The additional signals will be prefixed by the letter " S," and will be similar to those already in use ; the same scales for height of the cloud, distance of visibility and symbols for weather will be adopted.

3. The signals will be situated near the existing signals, but will be so placed as to appear the right way up to a pilot flying in a south-easterly direction.

(No. 18 of 1922.)

FLIGHT
AIRCRAFT ENGINEER & AIRSHIPS

THE GEDDES REPORT AND AIR ECONOMIES

CONSIDERABLE space is given in the Geddes "Axe" report to the air and possible economies, although, reading between the lines, there is a strong leaning in favour of a huge future for aircraft in the Nation's commitments, and in all Air Ministry activities, giving promise of effecting many savings in the two older services by reason of its great mobility. In a foreword, the Committee say: We have come to the conclusion that the cost of the defence of the Empire, so far as it falls upon the British taxpayer, must be considered as a whole. The necessity for this is much more apparent now than it was before the War, more especially because of the advent of the Air arm, which has come so much to the front, either as an addition to the older fighting services, or in substitution for them.

When dealing with the growth of expenditure generally, the Committee make the following statement :—

The Air Force was, essentially, a War creation, and owed its separate existence mainly to the necessity for preventing competition between the Navy and the Army for men and material in aerial warfare. It was also felt at that time, that a definite function of independent air attack was called for, but would not be realised, unless the Air arm was freed from Naval and Military control. No other nation, however, has as yet followed the example of this country in establishing such a separate force. The Navy and the Army both urge that the most effective and most economical use cannot be made of the Air arm, so long as the personnel is controlled by another service, and they suggest in general terms that it might be possible to effect economies by utilising air forces in place of, say, light cruisers in the Navy or cavalry in the Army, but no concrete proposals on these lines have been furnished to us. The War Office also suggests economies in administration—for example, in supply, transport, education, and medical services. On the other hand, it can be pointed out that by dividing the Air Force between the two Senior services, duplication in experiment, design, and supply would be inevitable, and that duplicate flying schools would result. To avoid duplication, the two senior Services admit the need for a certain amount of joint organisation of a subordinate character, but have given no clear appreciation of what this joint organisation should be.

There is the further argument that, without a separate existence, there is a grave danger that the Air Service would be unable to work out developments which might in the next decade or so entirely revolutionise methods of attack and defence, and so render possible very large economies in the cost of the fighting services as a whole, by substituting air for land or sea forces.

We cannot say that we have been convinced that the Air Force is less economically administered than the other fighting services, but we are impressed by the fact that public funds are admittedly being spent in both of the older Services, because of a certain overlapping with the Air. The question of aerial *versus* naval or military command in operations in the future will doubtless cause difficulties; but economies to an increasing extent ought to result in the older arms from the advent of the Air Force. We have in mind not only the substitution of aircraft for certain other arms of the older Services, such as light cruisers or cavalry, but a revolution in the method of carrying out certain operations. We are particularly impressed with the very large savings which we are told can be realised in the Middle East as soon as the transfer of responsibility from the Army to the Air Force can be effected. By the use of aircraft in this region, it has been found possible to reduce the estimates in respect of the Middle East from £27,000,000 in 1921–22, to £13,000,000 in 1922–23. It can no longer be denied that by the intelligent application of air power, it is possible to utilise machinery in substitution for, and not as a mere addition to, man-power.

Ministry of Defence

In our opinion, full economy in the fighting services cannot be realised under existing conditions. There is overlapping and duplication throughout. In order to fully realise these economies, the three Forces must be brought together by the creation of a co-ordinating authority, or a Ministry of Defence, responsible for seeing that each Force plays its part, and is allotted appropriate responsibility for carrying out various functions. The theory of such a Ministry in embryo appears already to exist in the Committee of Imperial Defence. With the creation of a co-ordinating authority or Ministry of this description; it would be possible to ensure that corresponding reductions in expenditure were realised when either of the older Services was relieved or assisted, and no additional expense or extra Ministerial appointment need, in our opinion, be involved, as the Minister and his staff, could all be drawn from existing organisations. All the arguments of an economic character, which have been urged for the absorption of the Air Force into the two older Services apply, in our opinion, also to the fusion of all three Services under one Minister. Complete co-ordination in Supply, Transport, Education, Medical and other Services, would then be possible.

We attach great importance to a settlement of this question in the interests of economy.

Dealing in detail with suggested savings in the Air Force, the Committee state :—

The criticism of the Estimates which follows, is based on the assumption that the Air Ministry will not be absorbed by the two older Services. We indicate economies which we think might be realised even if the recommendation as to a Ministry of Defence is not adopted; but we consider that further economies depend upon one co-ordinating authority being responsible for the three Services.

The Outline Estimates for 1922-23 compare with the Estimates for 1921–22 as follows :—

	1921-22. £	1922-23. £
Gross Estimates	16,367,867	13,317,100
Add—		
Middle East	1,081,000	1,720,700
War liabilities	1,585,000	504,900
Total	19,033,867	15,542,700
Appropriations-in-aid	622,400	2,585,400
Net total	18,411,467	12,957,300

The Air Ministry divide their expenditure in the following way :—

	1922-23. £
Active Service Squadrons	3,511,000
Other Establishments	7,912,000
Capital and miscellaneous expenditure including Supply and Research and Civil Aviation	4,944,000
	16,367,000
Deduct expenditure in India	825,000
	15,542,000

It will be seen that the expenditure on Active Service Squadrons is only 21 per cent. of the total expenditure.

We have continually before us the view of the Cabinet that no great war need be anticipated for at least ten years, and in these circumstances suggest that the question of a considerable reduction in the number of Squadrons should be considered. We recognise that a sufficient nucleus must be retained for training personnel, and, further, that the germ of co-operation with the other two Services must be kept alive. We consider, however, that all expenditure beyond this minimum should be eliminated unless the Service requiring a further allotment of Air Forces for co-operation with it can show that such allotment will result in savings in other directions.

For 1922-23 six-and-a-half Squadrons are shown as working in co-operation with the Navy and three in co-operation with the Army in the United Kingdom, and we feel that, having regard to the circumstances referred to above, these Squadrons should be reduced in number. We suggest they should be reduced to—

One Squadron in co-operation with the Navy in the United Kingdom,

One Squadron in co-operation with the Navy in the Mediterranean,

One Squadron in co-operation with the Army in the United Kingdom,

which would give a saving of six-and-a-half Squadrons.

If the Navy and the Army require further Air Units, we feel that they should be able to show reductions in their own provisions which would justify the supply of these units.

There are five Squadrons in Egypt and Palestine working in co-operation with the Army. It has not been shown

to us that proper allowance has been made for the existence of these Squadrons in fixing the force necessary for the garrisons in Egypt. In these circumstances we recommend that the question of reducing the number of Squadrons to three should be considered, unless greater economies can be effected in the Army expenditure by their retention. If the Squadrons in Egypt are reduced to three, we suggest that a fair proportion of these three should be allocated to the Air Force for use in Trans-Jordania. These suggestions would reduce the total number of Squadrons in the Air Force from 32½ to 24, and, including indirect expenditure on administration, training, reserves, etc., would involve a saving of over £2,500,000 per annum.

The numbers engaged in giving or receiving instruction are particularly striking, as the following figures show :—

	Officers.	Men.	Total.
Engaged in connection with education and training	532	5,669	6,201
Under training	466	6,035	6,501

The figures are exclusive of civilian teaching staff (fifty-one full time and a number part time). This appears to be a very heavy establishment of training personnel in comparison to the numbers under training.

The education given at Cranwell to the Cadets, apart from technical training, is similar in most respects to that given to the Cadets at Sandhurst and Woolwich ; but the total cost, namely, £850 per annum, is very much higher, due to the expensive technical training given. As in the case of Dartmouth, Sandhurst, and Woolwich, where the cost is £462, £373, and £366 respectively, the fees charged to the parents of Cadets are out of all proportion to the cost to the State, and, as in the case of those Colleges, we feel that a considerable increase in the fees should be imposed. We suggest that the fees should be raised from £75 per annum to £200 per annum, with a reduction of 50 per cent. in the case of sons of officers of H.M. forces, leaving also, as in the case of the other Services, a few places for scholarships or bursaries to boys whose parents are of slender means and who show marked ability by some prescribed test.

The cost of recruiting for the Air Force appears to us to be very high, namely, £26,350 for next year, and the matter has been fully discussed with the Chief of the Air Staff. As a consequence, the Air Ministry have seen their way to reduce their estimate of the cost of recruiting to £14,010, which is, however, equivalent to £7 per head per accepted airman, and still seems high.

	Gross Estimate.	Net Estimate.
	£	£
1921-22	3,143,000	3,105,000
1922-23	2,465,000	2,059,000
Reduction	678,000	1,046,000

The charges for provisions and transport account for a large percentage of this Vote. The provisions are mainly obtained through the Army so as to obtain the benefit of the Army's larger contracts. Clothing costs something over £200,000 per annum. The present arrangements as to clothing provide for the issue of a complete free kit on joining, and an upkeep allowance of 8*d*. per day, equal to £12 3*s*. 4*d*. per annum. As in the case of the Navy and Army, we think this should be reduced by one-third and a lower standard of upkeep accepted. All civilians have had to make their clothes last longer, and we see no reason why uniformed men should not.

We desire also to call attention to the travelling concessions, whereby, as in the case of the other fighting services, officers and men of the Air Force obtain return tickets at a single fare, the difference being paid by the Air Ministry. There seems to us to be no sufficient reason for the continuance of this concession.

One of the large items of expenditure in the Air Ministry Votes is for technical equipment. The estimate for 1922-23, compared with that for 1921-22, is as under :—

	Gross Estimate.	Net Estimate.
	£	£
1921-22	4,058,000	3,758,000
1922-23	2,383,500	1,352,000
Reduction	1,674,500	2,406,000

The large difference between the gross and net estimates for 1922-23 is accounted for by Appropriations-in-aid of upwards of £1,000,000, mainly repayments in respect of operations in India at the cost of that country, and in Mesopotamia at the cost of the taxpayer. The reduction of the gross estimates is due to the reduction of reserve stocks, and to the estimated life of an aeroplane being slightly increased. The latter, if justifiable, is a real economy ; but the reduction of stocks, with which we thoroughly concur, will hasten the day when stocks have to be replaced, and to that extent the annual estimates of Departments do not reveal the true cost.

It appears that there will be in stock on April 1 next 1,924 machines in excess of establishment.

We feel that the expenditure on conversion and reconditioning of old machines should be strictly limited to cases where satisfactory machines of a particular type required, or some other reasonably suitable type, are not available. We suggest for consideration, the reduction of expenditure under this Vote by £1,000,000.

The Air Ministry have also indicated their intention to ask for authority to spend an additional £500,000 on machines, stores, etc., over and above the amount provided in the estimate for Technical Equipment. This additional equipment is only required in the event of a serious war ; and having regard to the pronouncement as to the unlikelihood of immediate war, and the arguments set out above, we feel that this expenditure should not be authorised.

Included under the heading of Technical Equipment, is a sum of £352,500 in respect of mechanical and other transport. With regard to the estimated expenditure of £95,000 for the overhaul of 200 vehicles by the makers, we are by no means satisfied that an average cost of £475 is justified.

We have given attention to the position with regard to motor transport, and attach a statement showing the normal establishment asked for by the Air Force at home and abroad, which amounts to 1,761 motor vehicles. They have in addition to full establishment—which includes in many cases provision for reserve—a total of 1,436 vehicles. These are mainly touring cars, of which they have 164 surplus to establishment ; landaulettes, of which they have 34 surplus ; and lorries, of which they have practically 1,000 surplus. We consider that the whole of these additional vehicles should be surrendered. The same remark would apply to trailers used for motor transport, of which there is shown an establishment of 493, with 251 additional vehicles. The position with regard to motor-cycles is similar. There is an establishment of 512 cycles and 316 side-cars, with a surplus of 195 cycles and 248 side-cars which also should be surrendered. It appears to us that the establishment for motor transport is throughout on an unnecessary scale.

The Air Ministry propose to spend £50,000 on the purchase of armoured cars for Trans-Jordania. Both the Navy and Army used armoured cars during the War, and we consider that, if at all practicable, cars which were used in the War should be adapted for use in Trans-Jordania ; it ought not to be necessary to buy new ones.

Like the two Senior Services, the Air Force asks for considerable sums for works and buildings. The amount proposed to be spent on works, buildings, and lands in 1922-23 compared with the present financial year is as follows :—

	Gross Estimate.	Net Estimate.
	£	£
1921-22	3,048,000	3,018,000
1922-23	2,431,000	2,166,000
Reduction	617,000	852,000

Of the total amount of the estimate only £600,600 represents works which have not been commenced or in respect of which no commitments have been entered into.

In the present financial circumstances, we are of the opinion that any sanction which may have been given for these works should be cancelled, and that the case for any new commitments under this head should be fully reviewed.

Apart from these new works, there are a large number of cases of continuation expenditure, such as permanent roads, sick quarters, improvements to regimental accommodation, recreational facilities, etc., and we think that every case of this kind should be reviewed and that the total Estimate should be reduced by £1,000,000.

The largest work, which has already been commenced, raises an important question of principle. It is the provision of buildings at Halton to accommodate 2,000 boys for training as air mechanics, the total expenditure on which will reach some £720,000. Accommodation exists at Cranwell, where it is intended to train a further 1,000 boys, making a total of 3,000 boys under training. Under the present system, the boys receive three years' training, and then serve seven years with the Colours and two years in the Reserve. The cost of training each of these boys for a period of three years is £711, so that an amortisation charge of £129 per annum, or 7*s*. per day, during the seven years of active service, has to be

added to the pay of the mechanics of the Air Force when arriving at their cost to the state. With the reduction in the strength of the Force, there will be a corresponding reduction in the number of boys to be trained, even if the principle of training boys as mechanics is adhered to. There is already at Cranwell accommodation which actually takes 1,300 boys, and in the present financial circumstances we feel that the expenditure at Halton should be very fully reviewed, and that, without very full investigation as to the possibility of using other buildings or temporary accommodation, no further expenditure on this work should be incurred.

The cost to the country of boys trained by the Air Force during their time as mechanics, may be put at 16*s.* 6*d.* to 17*s.* 4*d.* a day, for seven days a week, and possibly non-substantive pay and marriage allowance in addition, representing a further 5*s.* 8*d.* a day. This cost of approximately £6 a week for a single man and £8 a week for a married man is altogether excessive. The alternative policy of recruiting tradesman personnel from engineering shops throughout the country commends itself to us, and we recommend its adoption.

It is understood that the reorganisation of the Air Ministry is under the consideration of the Secretary of State with a view to effecting further economies than those shown in the sketch estimates submitted to the Committee. We feel that, having regard to the suggested reduction in the strength of the Force, and the suggested reduction in the monies to be available for experiment and research, and civil aviation referred to hereafter, considerable reductions in the numbers of personnel in the Air Ministry should be possible, and we are of opinion that the provision of £825,000 asked for should be capable of a cut to £600,000.

Civil Flying

The amount provided for 1922-23, compared with 1921-22, is as follows :—

	£
1921-22	880,000
1922-23	700,000
Reduction	180,000

This expenditure includes certain meteorological expenses, but is exclusive of £107,500 expenditure at Headquarters, partly in connection with civil aviation and partly in connection with Meteorology. Civil aviation has not made the progress which its supporters anticipated, and, broadly speaking, it may be stated that at the present time there is no civilian flying between points in this country, the only regular services being the Cross-Channel services, which are heavily subsidised either by the French Government or the British Government, the fares charged to passengers being very considerably below the economic level. There are certain commitments, representing subsidies of £200,000 per annum for the next three years, and certain expenditure in connection with Meteorology which must be incurred ; but at the present time the amount spent on Meteorology at Headquarters, and under Vote 8 amounts to more than £150,000 a year, which appears to be capable of some reduction. If the contribution towards civil aviation be limited to the present commitments and a reduction made in the cost of Meteorology, we feel that the amount spent under these headings could be reduced by £400,000.

If the Air Force require a more complete and extended Meteorological service, we consider it should be provided for on the votes of the Ministry other than "civil aviation."

Auxiliary (Territorial) Air Force

A proposal has been put forward for the formation of an Auxiliary (Territorial) Air Force. The amount originally asked for was £360,000 for 1922-23, with a recurring expenditure of £160,000 per annum ; but it is understood that the Air Ministry feel that this force could be commenced with an expenditure of £167,000 and a recurring expenditure of £139,000.

The desirability of encouraging the art of flying with a view to the formation of a Defence Force is recognised ; but before any expenditure of this kind is sanctioned, we think that the whole question of the defence of the country should be reviewed. The War Office propose to spend £5,750,000 for a Territorial Force, and this force is primarily intended for defence against invasion. If the Auxiliary Air Force has the same object in view, we feel that, having regard to the unlikelihood of a great war, the country cannot afford a duplication of services of this kind. Therefore, if the Auxiliary Air Force is formed, it should be possible to make savings on the amount suggested for the Territorial Army. Here we are confronted with the dual and uncoordinated plans of two services.

In dealing with each of the Services, we have commented upon the extraordinary activity in the Department of Experiment and Research. There is probably more justification for continuance of experiment and research in connection with the Air Force, than in connection with the older Services, but we feel that a case for immediate hurry has not been made out, and that some reduction in these activities should be possible, without permanently injuring the development of the Service. . . . It is difficult for us to indicate any particular branch of activity in connection with research and experiment which should be discontinued ; but we feel that in the present circumstances a reduction should be made, and suggest that the limit of expenditure under this heading should be £1,000,000 for 1922-23, inclusive of all costs incurred at the Ministry or elsewhere, it being left to the Air Ministry to apportion this sum in the manner which is likely to be productive of the best results.

Conclusions

As a result of our consideration, we are of opinion :—

1. That the best way of obtaining economies which may be looked for from the full use of air-power in land and sea operations, and also economies in administrative, medical, and educational services, is by the creation of a Minister of Defence as a co-ordinating authority.

2. That the air units allotted to the Navy and Army should be reduced by eight-and-a-half Squadrons in accordance with our recommendations.

3. That, although we have no pre-War figure with which to compare the staffing of the Air Ministry and its establishments, considerable room for economy exists, both in administration and in policy. We have given a few examples in our Report, and, in particular, we recommend that the scheme of training boys at Halton should be abandoned.

4. That, apart from the reduction in machines—which follows upon our proposed reduction of the Air Force allotted to the Navy and Army—the provision in the Estimates for the re-conditioning of old machines and the purchase of new ones is excessive.

5. That in all the circumstances of the case, the Air Force Estimates should be reduced from £15,000,000 to £10,000,000.

In this recommendation, no account is taken of any reduction in pay and allowances which the Government may decide to make, and no account is taken of any abnormal increase in the non-effective Vote, caused by a reduction of personnel transferred to the Retired List.

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Aviation in Uruguay

CAPT. ERIC BUXTON, in a Department of Overseas Trade Report to the end of last year upon Uruguayan matters, states that in regard to aviation the principal centre of military aeronautics in Uruguay is the Military Flying School located at the Maroñas aerodrome. The machines employed consist of several Avros and Spads, in addition to a few Breguets and a Caproni. A regular course for Army officers has been established since February, 1921. A flying school for civilians was inaugurated at the Colon aerodrome of the Centro Nacional de Aviacion a few months ago.

In April last a service was commenced between Buenos Aires and Montevideo in connection with the delivery of *La Nacion*, one of the leading Argentine newspapers ; this was the first real attempt to establish a regular service by means of aeroplanes between the two capitals, but it was abandoned shortly afterwards. It is likely, however, that further efforts to establish a passenger and mail service over this route will be made, but in the meantime commercial aviation is not being developed on this side of the River Plate.

According to *The Standard*, Buenos Aires, of November 22, 1921, a regular aerial service is to be established between Buenos Aires and Montevideo by the Compañia Rio Platense de Aviacion, which has imported some Airco-Rolls-Royce machines. The company realises that until it is possible to run this service with much greater frequency it cannot be financially successful, but, on the other hand, if a tariff be established sufficiently high to allow profits on such an infrequent service, there is little doubt that the expense would effectively kill the business. The journey from centre to centre will only take 2 hrs. 30 mins., the crossing by air being made at an average speed of 80 kms. per hour.

In addition to the regular service to Montevideo, arrangements will be made so that parties of four can go direct to Punta del Este at a tariff of $160 each. This service should prove a great boon to holiday-makers as the saving in time will be very considerable.

CORRESPONDENCE

The Editor does not hold himself responsible for opinions expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters intended for insertion in these columns.

SOARING FLIGHT

[2052] During the many voyages made by Lord Kelvin in connection with his work on submarine cables and also in his own yacht, he had good opportunities of studying the behaviour of gulls at the stern of a steamer. No evidence is known to me that he ever saw any other kind of soaring flight. When asked his opinion as to how it was done, he didn't say that the gulls took advantage of ascending currents; he said, "That which puzzled Solomon puzzles me also."

Dr. Bryant tells us (in his letter 2048 in your issue of December 15, 1921) that he has never had an opportunity of observing gulls at the stern of a ship. Is it not possible that this is the explanation of his holding opinions opposite to those of the two authorities above quoted, both of whom had studied the facts at first hand? In my original letter on the subject (2046 in your number of November 24, 1921) I had stated that the question whether or not gulls make use of ascending currents at the stern of a steamer would long ago have been settled were it not for the fact that soaring flight is a question about which every one seems too clever to learn. Dr. Bryant's view that further learning is unnecessary fails to convince me.

The prevalent habit of settling the nature of soaring flight without reference to the facts of the case reminds me of a controversy that once took place in the Middle Ages as to the number of teeth possessed by a horse. Many learned treatises were written advocating one view or another; but no one ever thought of looking in the horse's mouth. Such enormously practical results are likely to accrue from the discovery of the nature of soaring flight that it is high time that people should begin to "look into the horse's mouth" as regards this subject. What needs to be explained is not merely how a bird can remain posed in the air on the windward side of a haystack. We want to know how it is that a flock of cranes can glide across the sky without loss of height and at a speed that may reach 40 or more miles per hour, as I have described at length in my book "Animal Flight." We also want to know what happens to the air flowing over the stern of a steamer that makes it suitable for the soaring of gulls. Perhaps the air has acquired an increased degree of turbulence. The view is now gaining ground that the energy of soaring flight is derived from turbulent motion; but we are very far from understanding how this motion is able to propel a bird—how a bird weighing, perhaps, ten or more pounds can glide at from 6 to 10 metres per second speed, and with a well-marked gain of height, in air in which there is not enough turbulence to blow out a lighted match.

The gulls at the stern of a steamer offer a convenient opportunity for an experimental investigation. If they use ascending currents, the first thing to prove, as a formal control if for no other reason, is that they cannot soar in a descending current. The descending current on the leeward side of the stern would give an opportunity of testing this point.

In December, 1920, when in the Great Bitter Lake, when the steamer was going very slowly, gulls were seen by me gliding in the ascending current on the windward side of the ship, and also in the probable overhang of this current at some height above the leeward side of the stern. Their flight in this current was quite different from that shown by other gulls that were seen on the leeward side of the stern at a lower level and outside the limit of the ascending current and that were in true soaring flight.

I hope shortly to be in London, and to have an opportunity of publishing other facts bearing on this point.

E. H. HANKIN

c/o H. S. King & Co.,
9, Pall Mall, S.W. 1
Jan. 25.

IN PARLIAMENT

Commercial Air Routes

MR. L. MALONE on February 10 asked the Secretary of State for Air the approximate mileage flown on recognised commercial routes in 1919, 1920, and 1921; what steps are being taken by the Controller of Civil Aviation to increase the routes, and which routes; and when can it be expected that reasonably reliable services will be found in operation on such routes as, say, to Egypt and to India?

Captain Guest: The mileage flown in 1919, 1920, and 1921 was 105,000, 642,000, and 224,000 respectively. As regards the second part of the question, the policy of the Government was announced in another place by my right hon. friend on October 27 last. As regards the last part of the question, it is not possible at present to give any forecast of the date when regular commercial services will be in operation to Egypt and India.

Mr. Malone asked the Secretary of State for Air the number of commercial routes now operating under the British flag; and what assistance, financial or otherwise, are they now receiving?

Captain Guest: In Europe the only route in operation under the British flag is that between London and Paris. The terms of the financial assistance given to the two firms operating this route are given in Command Paper 1521 presented to Parliament in October last. The agreements set forth in that Paper have been extended to the 28th instant. Additional assistance is given by the provision of aerodromes, emergency landing grounds, and the ground organisation, wireless and meteorological facilities provided at these aerodromes. The development of various routes in the Dominions is in contemplation by the Governments concerned. It is believed, however, that none of these routes is in regular operation at the present time.

Airships

MR. MALONE asked the Secretary of State for Air what is now the policy of the Air Ministry as regards the development of airships?

Captain Guest: In accordance with the agreement made with the Dominion Prime Ministers during the conference last summer, the Government agreed to suspend disposal of airships and airship material until the Prime Ministers had had an opportunity of consulting their Parliaments in regard to the establishment of an Imperial airship route. Replies from the Dominions and India are not yet complete, but the Governments of South Africa and New Zealand have stated that, owing to financial reasons, they are unable, at present, to participate in such a scheme.

Anti-Aircraft Artillery Staff Course

Army Order 25 of 1922 provides for the holding of anti-aircraft artillery staff courses of about five calendar months, of which nine weeks will be spent at the Artillery College and 13 at the Anti-Aircraft Artillery School.

Officers and non-commissioned officers under training as instructors in anti-aircraft gunnery will be required to pass the Gunnery Staff Course, Part I, before undergoing the anti-aircraft artillery staff course (Gunnery Staff Course, Part III), which is intended to afford such instruction in the theory and practice of gunnery and in artillery material as is applicable to anti-aircraft defence only. Officers and non-commissioned officers of the Regular Army will be given one month's leave after the termination of the course if they so desire.

Germany and Aircraft Freedom

FROM Berlin, under date February 10, it was announced that the prohibition by the Allies of the manufacture of aeroplanes and air material will cease as from May 5 next. The Council of Ambassadors decreed the date, February 5, as that on which Germany had fulfilled the terms of Article 202 of the Peace Treaty, and a period of three months has to elapse before manufacture and import can be resumed.

The announcement adds that the manufacture will not be entirely released from control. By the term of the London ultimatum Germany undertook to observe such regulations as the Allies might impose for the differentiation between military and civil aeroplanes. The Allies have not yet communicated to the German Government what these regulations will be, or what organisation it is proposed to set up to see they are carried out. It is assumed, however, that the Inter-Allied Air Commission will terminate its work on May 5, and on the new regulations will depend the further development of the German air industry.

Australia Building Up Air-Defences

ARRANGEMENTS are being made by the Australian Government, a correspondent of *The Times* states, to establish this year two aerial defence bases, in Victoria and New South Wales. Developments in this direction have recently been facilitated by the acquisition by the Commonwealth Government of 128 aeroplanes of various types as a gift from the British Government.

It is the declared policy of the Australian Government to establish aerial defence bases in all the States of the Commonwealth as finances permit, and with this object in view the Victorian base is to be constructed so as to form a headquarters for all the State units. Here there will be a large depôt for equipment and stores, and a training school for pilots, observers and aerial gunners.

Plans are also being made to establish a seaplane unit at Sydney to work in co-operation with the Navy. Nearly all the equipment needed for this unit has been given by the British Government.

FLIGHT

THE DEVELOPMENT OF COMMERCIAL AIRWAYS*

By SIR HENRY WHITE-SMITH, C.B.E.

WHEN Sir Henry wrote the very instructive and complete paper which he read before the Institute of Transport on Monday of this week, he had no means of knowing that the Air Conference would be held almost at the same time. Consequently, as he pointed out in his introductory remarks, he felt at some disadvantage, inasmuch as he thought he might be repeating statements and expressing views already given at the Guildhall last week. We think, however, that Sir Henry need not have entertained any fears on that score. In the first place, he was addressing a body of men who, although well-versed in the intricacies of older means of transport, are not, presumably, quite so familiar with the problems of the newest form of all. Secondly, although the figures have by now, perhaps, been slightly altered, there is little doubt that the figures of cost estimated by Sir Henry at the last Air Conference were very near the mark indeed, and have served as a very useful basis on which to build an estimate of the cost of air transport. In the present paper Sir Henry altered some of the figures to conform with the greater efficiency of modern machines, and it may be taken that his latest figures come very near representing actual facts as they apply at the present time.

In view of the fact that he was addressing a body not at present intimately connected with aviation, it was eminently desirable that Sir Henry should preface his remarks on the development of commercial airways with a review of what has already been done at home and abroad. This he did in a very complete manner, considering that only limited time and space were available for the purpose. As most of this information will already be more or less familiar to readers of this journal, it is not proposed to deal with it at length here, and we shall confine outselves to recording the fact that Sir Henry, during the first part of his lecture, managed to give a very complete picture of aviation as it has developed up to the present time. A series of tables were thrown on the screen, based upon the figures given by the C.G.C.A. in his last half-yearly report, and dealing with statistics relating to the number of flights made and passengers carried, the value of goods carried by air and the number of letters transmitted by air mail, figures of the efficiencies attained on the various routes, statistics of accidents, etc. Sir Henry also showed a series of lantern slides illustrating modern aircraft, both aeroplanes and seaplanes, so as to give his audience an idea of the types of machines that are now being used.

A brief review of the present position of aerial transport was also given, explaining the present subsidy arrangement, and giving the names of the firms which are operating at present, or which will be operating in the spring. From this brief *résumé*, Sir Henry said, it will be realised that interest in civil aviation is increasing as each country realises the great possibilities of air transport.

Sir Henry then dealt with the question of ground organisation, and, incidentally, stated that he disagreed with a statement recently issued by the Air League, reflecting on the Air Ministry and the Department of Civil Aviation, and the work they had done. He thought such attacks unfair, and considered that they could only be based on a lack of knowledge of what the Department had done. He felt sure that if the route between the French coast and Paris were as well organised as the route from London to the coast the cross-Channel services would be even more efficient than they are now. On the very important subject of night flying, Sir Henry said he thought we were well in sight of night flying being carried out during the summer months, although it will not be easy to carry on during the more severe conditions obtaining in the winter. He then quoted some observations which he made on the subject of night flying at the last Air Conference, pointing out how night flying will materially increase the usefulness of air transport. A brief indication was given of the lighting arrangements from Croydon to the coast, and reference was made to the great services which wireless and meteorology can and do render to aviation.

Sir Henry then turned to commercial considerations, and summarised the figures which he arrived at in his paper read before the last Air Conference. The cost of carrying a passenger from London to Paris was £4 16*s*., or 4¾*d*. per passenger-mile, and the cost of conveying 1 lb. of cargo from London to Paris was 4¾*d*., or 3*s*. 7*d*. per ton-mile. These figures were based on the use of the most efficient machines existing at that time, and on the assumption that a full load was carried, although a more correct figure would be that based on a 75 per cent. load factor. On that basis the figures became £7 4*s*. per passenger (7¼*d*. per passenger-mile), and 7*d*. per lb. for cargo (5*s*. 4½*d*. per ton-mile). The above figures Sir Henry had recalculated in the light of later experience, and on a basis of 1920 costs and 75 per cent. load factor the figures became £8 6*s*. per passenger (8¼*d*. per passenger-mile) and 8½*d*. per lb. of cargo (6*s*. 9*d*. per ton-mile). For the most modern machines, such as the Bristol 10-seater or the "D.H.34," Sir Henry arrived at the following figures, based on a 75 per cent. load factor:—Passengers £6 10*s*. (6¼*d*. per passenger-mile), and 6*d*. per lb. for cargo (4*s*. 7½*d*. per ton-mile). Sir Henry thought that in the new year the machines in use will be of modern type, so that by the end of the year there should be available some definite information regarding costs. Under the new subsidy scheme this information will be in the hands of the Department of Civil Aviation, which, it is understood, intend to make it public.

Regarding the future, Sir Henry said that reductions will be achieved by perfecting traffic management and upkeep, and he pointed out two methods by which success in transport may be attained. The first is by increase of revenue, and the second by reduction in operating charges. Improvements in increase of revenue might, he thought, be effected by a greater measure of propaganda, publicity and advertising of the aerial services, but principally by the creation of confidence. The average Englishman, Sir Henry said, is a very conservative person, and we have to make him develop the habit of air travel. The lecturer pointed out that one of the factors that will inspire the public with confidence is for the operating companies always to run their aircraft to schedule by starting at the times stated in their time-tables. One question which has very considerable bearing on the increase of passenger traffic is that of carrying passengers' luggage. At present there is considerable uncertainty as to whether or not a passenger will be allowed to take more than a small handbag weighing up to about 30 lbs. free of charge. Sir Henry thought that, although carrying luggage in the same machine as that conveying the passengers has the advantage of ensuring that the luggage arrives with the passenger, it would be a mistake to load up with a lot of heavy luggage an aircraft built specially for speed and for the comfort of passengers. He thought it would be a matter for the transport companies, either individually or collectively, to arrange for special luggage machines, and suggested that there should be at a central point in London a collecting depôt, where passengers' luggage might be taken the day before, or in the early morning of the day on which the passenger wishes to travel. The luggage would be passed through the customs at this depôt, and would then in bond be taken to the aerodrome and placed in the luggage machine. On arrival at the other end the reverse process would take place.

On the question of goods carrying by air, Sir Henry thought that this class of traffic must be specially catered for, and that a slower type of machine could be used. By having machines specially designed for the purpose greater space could be provided and greater quantities carried than is the case with the present type of machine. More rapid handling at the terminals is also necessary, Sir Henry thought, and if the scheme outlined to deal with luggage was put into force, the bonded collecting and distributing centres could also be used for the handling of goods traffic.

Turning now to the question of reduction of costs, Sir Henry thought there is considerable scope under this heading. He thought that probably savings may chiefly be effected by improvements to the ground organisation. The aircraft designer can also help to a considerable extent in this direction by simplifying detailed parts of the machine and by making such parts as require to be overhauled more readily accessible. The accompanying table indicates how important is this aspect of the question. Maintenance represents 16 per cent. of the total running costs; depreciation represents about 18 per cent., and insurance about 6 per cent. The question of the economical use of petrol and oil is of great importance, as will be realised when it is pointed out that the cost figures for petrol and oil form 23 per cent. of the total running costs. Improvements will come gradually as experience points the way, but much can be done by the collaboration of the traffic manager and the aircraft constructor—one to state his experience and the other to respond and fill the requirements for which the transport operator calls.

* *Résumé* of Paper read before the Institute of Transport on Feb. 13, 1922.

Operating Charges of "Bristol" ten-seater Aeroplane.

	£	s.	d.	Percentage of total operating charges.
General Charges—(Personnel, Advertising, Rent at Terminal Aerodrome, Transport, Administration Expenses, etc., etc.	18,160	0	0	20.9
Maintenance—Labour	5,100	0	0	5.8
Spare Parts (based on 25 per cent. of value of machines)	9,000	0	0	10.3
Pilots at £1 per hour, plus retaining fee	6,800	0	0	7.8
Petrol and oil, 6,000 hours	20,000	0	0	23.0
Insurance of Aircraft at 15 per cent.	5,400	0	0	6.2
Depreciation of Machines :— 3,000 flying hours—engines, 2,000 ,, —aeroplanes	16,000	0	0	18.4
Interest on Capital—10 per cent. ..	6,600	0	0	7.6
	87,060	0	0	100.0

	£	s.	d.
Cost per flying hour	14	10	0
,, aircraft mile		2	$10\frac{3}{4}$
,, passenger mile			$4\frac{1}{2}$
,, passenger per journey of 240 miles on 100 per cent. load factor	4	7	0
Cost per passenger on 75 per cent. load factor	6	10	6
Cost per passenger on 50 per cent. load factor	8	14	0
Cost per ton of cargo per journey of of 240 miles	37	2	0
Cost per ton mile		3	1
Cost per lb. of cargo per journey of 240 miles on 100 per cent. load factor			4
Cost per lb. of cargo per journey of 240 miles on 75 per cent. load factor			6
Cost per lb. of cargo per journey of 240 miles on 50 per cent. load factor			8

Sir Henry then proceeded to outline the commercial advantages of aircraft, pointing out that these may be put under three main headings—speed, mobility and direct transit. As far as speed is concerned, aircraft has an outstanding advantage over all other forms of transport. Even today we do not think of aerial travel except in terms of 90 or 100 m.p.h., and in the future Sir Henry did not see any reason why we should not employ higher cruising speeds, such as 130 m.p.h. To illustrate the gains which can be effected by air travel, Sir Henry showed a table of times taken by the express train and boat services to reach the principal towns in Europe, and also the time in which the aeroplane could complete the journey. Under the heading of mobility, Sir Henry pointed out the advantages of air lines in being able to plan their routes without having to consider the question of establishing a highly expensive permanent way. While considering the question of mobility, the lecturer said he would like to draw special attention to one particular type of machine, the amphibian, which possesses the great advantage of being able to alight in and depart from even the centre of a big town, provided a river or waterway is available. Under the third heading, that of direct transit, Sir Henry pointed out the ability of the aeroplane to move goods from one point to another with as little handling as possible, and the very great advantages arising from this fact. In conclusion, Sir Henry said that, while claiming these advantages for commercial air transport, he did not suggest that it was going to displace the older forms, but, on the contrary, he believed it would be additional and auxiliary to them.

The discussion which followed the reading of the paper was opened by the Under-Secretary of State for Air, Lord Gorell, who said that he was pleased to find that the lecturer had shown illustrations of the excellent work done by aircraft in Canada, as this work was not nearly so well-known as it deserved to be. He also agreed with the lecturer that the carriage of goods by air was important, and thought that, ultimately, this form of air transport might become more important than the carriage of passengers and mails. As a piece of exclusive information, the Under-Secretary informed the audience that news had just come through that, on the question of airship services, India regretted not being able at present to see its way to take part in such an undertaking. Lord Gorell stated that he had been severely criticised for pessimism, but that he did not think this was quite deserved, and he thoroughly believed in the future of aviation. He quoted Lord Weir's remarks at the Air Conference on the comparison between the balance sheets of machines three years old, and those of modern type, and how such a comparison led one to believe that the time will not be far off when civil aviation will be able to stand without artificial support. The policy of the Government, he said, was to place the cross-Channel services on a commercial basis. The next step would be to attempt to arrive at an international agreement with France, for the extension of services to Malta, and later to Cairo and Karachi. With regard to the Cairo-Baghdad route, as soon as the necessary organisation was available, this route should be handed over to commercial companies.

Brig.-General Sir Sefton Brancker said that, at the Air Conference, he had complained of seeing nothing but familiar faces, whereas at the Institute of Transport, he was pleased to be among more unfamiliar surroundings. He thought one could sub-divide the question of air transport under three heads. The first for use over densely-populated areas, the se ond between places of importance separated by sparsely-populated areas, and the third trans-oceanic transport. For the first, high efficiency and high speed were required, whereas for the second smaller speed was required, and for the third, he thought the airship most suitable.

Stability was a feature of aeroplanes which he believed to be of great importance, and one for which he was constantly pleading. He would do so again, and stated that with a stable aeroplane we could fly in gales, fog, rain, snow and everything else. On the question of economy, he thought that in a couple of years petrol would be a good deal cheaper, which would help aviation to a great extent.

Lieut.-Col. W. A. Bristow said he had expected to hear the views of transport people, but that it seemed that one had been listening to the usual aeroplane people instead. While appreciating General Brancker's plea for stable aeroplanes, he did not see how that was going to help one a great deal when the engine stops. On the subject of night-flying, he was not very confident yet, and suggested that, personally, his feelings were that before he would be really happy flying at night, some form of lighthouse of approximately the power of the sun would be required. He quoted figures of German commercial activities, especially of the *Deutsche Luft-Rederei*, and stated that if Germany had managed to do as much as this, under all her severe handicaps, there was no doubt that she regarded commercial aviation very seriously, and would make great strides as soon as she was at liberty to develop freely.

Commander James Bird, of the Supermarine Aviation Works, said he regretted very much that at the Air Conference no mention was made of seaplanes, and of all they could do and had already accomplished. He pointed out that a great deal of the development work abroad had been done by seaplanes. As a maritime nation, and in view of our far-flung Empire, he thought that much more attention should be given to the seaplane. As regards costs of air transport, he pointed out that seaplanes did not require the expensive organisation which was necessary for land machines, as they could make use of existing seaports and lighthouses. Alighting at night, or in a fog, is relatively easy for the seaplane, which need only worry about altitude, and but little about lateral direction. Commander Bird also referred to the use made by the guiding electric cable in New York Harbour, and at Portsmouth, and indicated the possibllity of its application to the directing of aircraft. As regards amphibians, he was sorry to see that the Under-Secretary of State for Air did not see any possibility of opening up the Irish air route in the near future. This route would have called for, and would have been well served by, the amphibian type of machine. He thought the Air Ministry was making a mistake in not paying sufficient attention to the amphibian from the commercial point of view, and in leaving it to the Services to develop this type. Finally, as an indication of what developments the future might hold as regards seaplanes, Commander Bird stated that some time ago he had had a conversation with Mr. Thornycroft, and they had arrived at the somewhat startling result, that a modern destroyer, if relieved of certain not absolutely essential things, would have enough power for her weight to fly on her existing engines if wings of suitable size were fitted. He also mentioned that something is being done in the matter of very large and seaworthy seaplanes, and that his firm was, at present, engaged on the construction of a large flying-boat, which was intended normally to be moored out, and only leave the water for overhauls, much after the fashion of a ship going into dry-dock. The crew would sleep on board, suitable cabin accommodation and berths being provided.

FLIGHT
THE ROYAL AIR FORCE

London Gazette, February 7, 1922

General Duties Branch

The follg. are granted permanent commns., retaining their present substantive rank and seny., with effect from the dates indicated. *Gazettes* of those dates, appointing them to short service commns., are cancelled :—

Flying Offrs.—E. R. C. Hobson, D.F.C. ; Dec. 5, 1919. H. L. P. Lester ; Dec. 19, 1919.

Obs. Offr.—C. P. M. B. Caillard ; Oct. 24, 1919.

Lieut. M. G. Penny, R.A., is granted temp. commn. as a Flying Offr. on secdg. for four years' duty with the R.A.F. ; Jan. 20.

The follg. are restd. to full pay from half-pay :—Flight-Lieut. E. Drudge, M.B.E. ; Feb. 4. Flight-Lieut. H. V. German ; Feb. 2. Flying Offr. C. C. Bazell ; Jan. 31.

Flying Offr. S. A. H. Bowyer resigns his short service commn., and is granted rank of Capt. ; Jan. 8.

Stores Branch

Flying Offr. A. T. Shaw is granted a permanent commn., retaining his present substantive rank and seny., with effect from Sept. 12, 1919, and is transfd. to the Stores Branch, with effect from Dec. 6, 1921. *Gazette* Sept. 12, 1919, apptg. him to a short service commn., is cancelled. Sec. Lieut. G. G. C. Pigott is granted a short service commn. as a Flying Offr. on probation, with effect from, and with seny. of, Jan. 28. Flying Offr. D. A. W. Sugden is granted a short service commn. in the rank stated, with effect from, and with seny. of, Dec. 17, 1921. C. N. Scott is granted a temp. commn. as a Flying Offr. on probation ; Jan. 15, 1921 (substd. for *Gazette* Feb. 4, 1921).

Nursing Service

Miss I. M. Tench is confirmed in her appt. as a Staff Nurse ; July 13, 1921.

Memoranda

Three Cadets are granted hon. commns. as Sec. Lieuts. with effect from the dates of their demobilisation.

Sec. Lieut. W. Mylam is deprived of permission to retain his rank on conviction by a Field General Court-Martial ; June 7, 1921.

Erratum

Gazette of Jan. 13 (FLIGHT, Jan. 19, p. 43) :—In notification relating to Flight-Lieut. J. S. Smith, for *Gazette* of Dec. 27, 1921, read *Gazette* of Dec. 30, 1921.

London Gazette, February 10, 1922

Air Commodore F. C. Halahan, C.M.G., D.S.O., M.V.O., is apptd. Director of Aeronautical Inspection, Air Ministry ; Jan. 3.

General Duties Branch

Flight Lieut. C. P. O. Bartlett, D.S.C., is placed on half-pay, Scale B ; Feb. 3. Pilot Offr. on probation D. C. Gray relinquishes his short service commn. on account of ill-health ; Feb. 1.

Memoranda

Three Cadets are granted hon. commns. as Sec. Lieuts. with effect from the dates of their demobilisation.

Hon. Sec. Lieut. C. W. T. Macgillivray relinquishes his hon. commn. on joining the T.A. ; Dec. 20, 1921.

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified :—

Air Commodores.—F. C. Halahan, C.M.G., D.S.O., M.V.O., from Directorate of Equipment (Air Ministry) to Director-General of Supply and Research, on appointment as Director of Aeronautical Inspection. 3.1.22. H. C. T. Dowding, C.M.G., from No. 1 Group Headquarters (Inland Area) to Headquarters (Inland Area), as Chief Staff Officer. 27.2.22.

Group Captains.—P. L. W. Herbert, C.M.G., C.B.E., from Headquarters (Inland Area) to Air Ministry (Directorate of Training and Organisation), as Deputy Director of Training. 27.2.22. E. R. Ludlow-Hewitt, C.M.G., D.S.O. M.C., A.D.C., from Directorate of Training and Organisation (Air Ministry), on appointment as Air Secretary to the Secretary of State for Air. 1.2.22.

Wing Commanders.—W. L. Welsh, D.S.C., A.F.C., from No. 14 Squadron (Middle East Area) to R.A.F. Depôt (Inland Area). 17.1.22. F. Ranken, O.B.E., from R.A.F. Depôt (Inland Area) to Half-pay List. 1.2.22.

Squadron Leaders.—T. S. Rippon, O.B.E., from Headquarters, R.A.F., India, to Headquarters (Middle East Area). 7.1.22. G. S. Trevin, A.F.C., from No. 10 Group Headquarters (Coastal Area) to command Seaplane Training School (Coastal Area). 15.2.22. L. F. Forbes, M.C., from Iraq Group Headquarters (Middle East Area) to R.A.F. Depôt (Inland Area). (Supernumerary.) 31.12.21. G. W. Robarts, M.C., from R.A.F. Depôt (Inland Area) to No. 7 Group Headquarters (Inland Area). 1.2.22. B. L. Huskisson, D.S.C., from Iraq Group Headquarters (Middle East Area) to Armament and Gunnery School (Cadre) (Inland Area), as Chief Fighting Instructor. 15.2.22. J. McCrae, M.B.E., from R.A.F. Depôt (Inland Area) to No. 5 Flying Training School (Inland Area). 18.2.22.

Flight Lieutenants.—J. R. McCrindle, M.C., O.B.E., from British Delegation (Air Section), Paris, to Half-Pay List. 25.11.21. B. A. Malet, D.F.C., from No. 10 Group Headquarters (Coastal Area) to Seaplane Training School (Coastal Area). 15.2.22. M. H. Butler, D.F.C., from No. 5 Squadron (India) to R.A.F. Depôt (Inland Area). 7.1.22. E. Meynell, D.C.M., from Stores Depôt, Egypt (Middle East Area), to R.A.F. Depôt (Inland Area). 17.1.22. H. McW. Daniel, M.B., from Aircraft Park, India, to R.A.F. Depôt (Inland Area). 7.1.22. C. H. N. Nunn, from No. 27 Squadron (India) to R.A.F. Depôt (Inland Area). 7.1.22. C. P. O. Bartlett, D.S.C., from No. 39 Squadron (Inland Area) to Half-pay List. Pending embarkation overseas. 3.2.22. C. G. Hetherington, M.B.E., from Headquarters, No. 11 (Irish) Wing to School of Technical Training (Men) (Inland Area). 1.2.22. J. H. Hagon, from R.A.F. Airship Base (Coastal Area) to R.A.F. Depôt (Inland Area). To remain attached to School of Photography. 1.2.22.

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The Airship Officers' Club

VERY happy was the gathering of members of the Airship Officers' Club, at the Connaught Rooms on February 8, for their Annual Reunion. It was like a delightful family party, and the President, Rear-Admiral Murray F. Sueter, M.P., was very welcome in the Chair. In the course of his remarks, the Admiral recalled the early days of airships and their troubles. In spite of all the enemies who were just now conspiring to belittle the lighter-than-air craft, he was convinced that in the near future airships would be recognised as ideal for transport for long journeys. Mr. Ashbolt, the Agent-General for Tasmania, who supported the Chairman, was a strength to the meeting. He was as enthusiastic as ever, and again advocated airships as the connecting link for cementing the interests of the British Empire.

Amongst about fifty members of the Club and others who were present were Rear-Admiral Davidson, the Italian Air Attaché, Major G. H. Scott, Major G. F. Herron, an indefatigable worker in keeping the units of the Club together, Comm. F. L. M. Boothby, Lieut.-Col. Mervyn O'Gorman, etc.

Airmen's Marriage Allowances

THE official index figure for the cost of living having fallen to 92 at January 1, 1922, it is notified, in accordance with Air Ministry Weekly Order 109 (para. 58) of 1921, that the rates of marriage allowance for the year commencing April 6, 1922, have been revised.

Disbandment of London Mechanical Transport Section, R.A.F.

IT is notified for information that the Air Ministry Garage, Ebury Bridge Road, S.W. 1, closed at midnight on February 5, 1922, and the London Mechanical Transport Section ceased to exist.

Withdrawal of R.A.F. Units from Ireland

IT has been decided that, as soon as the necessary arrangements can be made, all R.A.F. units shall be withdrawn from Ireland and the existing air stations disposed of. With this end in view, an advance party of Headquarters No. 11 (Irish) Wing, R.A.F., has been sent from Baldonnell (near Dublin) to Spittlegate (Lincolnshire) for the purpose of opening a new Wing Headquarters there.

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Oranmore Aerodrome (Galway) has already been closed down, and the unit stationed there, a Detached Flight of No. 100 Squadron, has been moved to Baldonnell, while "A" Flight of No. 4 Squadron has already returned to England and rejoined its Squadron Headquarters at South Farnborough.

The machines are returning home by air, and the personnel and equipment by rail and boat as rapidly as circumstances permit.

Move of No. 70 Squadron to Irak

No. 70 Squadron has moved from Heliopolis to Baghdad, and was transferred for all purposes from the Egyptian Group to the Iraq Group, with effect from February 1, 1922.

Transfer to Coastal Area of Aeroplane Experimental Establishment, Martlesham Heath

THE Aeroplane Experimental Establishment, Martlesham Heath, and the detachment at Orfordness, were transferred from the Inland Area to the Coastal Area, with effect from February 1, 1922.

The King's Levee, February 10

AMONGST those who attended the Levee held by His Majesty the King at St. James's Palace on February 10 were the following :—Air-Marshal Sir Hugh Trenchard, C.B., D.S.O., K.C.B., Wing-Comdr. L. Greig (in attendance on H.R.H. the Duke of York), Capt. the Right Hon. F. E. Guest, C.B.E., D.S.O., M.P., Secretary of State for Air, Air Vice-Marshal Sir John M. Salmond, K.C.B., C.M.G., D.S.O., Wing-Comdr. A. H. Wynne, O.B.E., Flight-Lieut. H. H. Balfour, M.C., Flight-Lieut. R. H. Saundby, M.C., A.F.C., Flying Officer H. L. Macro, D.F.C. The following were presented to the King :—Flight-Lieut. J. C. Brooke, D.S.C., Observer Officer R. F. Casey, D.F.C., Flying Officer H. A. Dinnage, Flight-Lieut. V. Greenwood, Flight-Lieut. R. Halley, D.F.C., A.F.C., Sqdn.-Ldr. W. C. Hicks, A.F.C., Flight-Lieut. L. V. Hirst, Observer Officer G. McCormack, Sqdn.-Ldr. J. C. Quinnell, D.F.C., Flight-Lieut. E. B. Rice, Flying Officer R. L. Sweeny, Flight-Lieut. A. W. Turner, D.C.M., Flight-Lieut. C. Turner, A.F.C., Flying Officer A. R. Wardle, etc.

IMPORTS AND EXPORTS, 1921-1922

AEROPLANES, airships, balloons and parts thereof (not shown separately before 1910). For 1910 and 1911 figures see "FLIGHT" for January 25, 1912; for 1912 and 1913, see "FLIGHT" for January 17, 1914; for 1914, see "FLIGHT" for January 15, 1915; for 1915, see "FLIGHT" for January 13, 1916; for 1916, see "FLIGHT" for January 11, 1917; for 1917, see "FLIGHT" for January 24, 1918; for 1918, see "FLIGHT" for January 16, 1919; for 1919, see "FLIGHT" for January 22, 1920; for 1920, see "FLIGHT" for January 13, 1921; and for 1921, see "FLIGHT" for January 19, 1922.

	Imports		Exports		Re-Exportation	
	1921.	1922.	1921.	1922.	1921.	1922.
	£	£	£	£	£	£
Jan. ...	4,459	1,152	87,128	76,552	2,285	23

Royal Aeronautical Society

Students' Meetings—The next students' meeting will be held in the Society Library at 7 p.m., on Thursday, February 23, when Mr. G. R. Irvine will read a paper on "Some Possible Improvements in Aero Engines." Mr. A. E. L. Chorlton, C.B.E., M.I.C.E., M.I.M.E., will take the Chair.

Cambridge University Aeronautical Society

SYNOPSIS of this term's lectures, etc.: January 25, "Theory of Flight, Rigging Engines, etc." (Cinema films); February 1, "Installation," by Brig.-General R. K. Bagnall Wild, C.M.G., C.B.E.; February 8, "Performance Testing of Aircraft," by Major T. M. Barlow, M.Sc., F.R.Ae.S., A.M.I.C.E.; February 15, "The Auxiliary Air Force," by Air-Marshal Sir Hugh Trenchard; February 22, General Meeting, Election of Officers, etc.; March 1, "High Altitude Engines," by Mr. H. R. Ricardo; March 8, "Aerial Manœuvre in its Relation to Modern Flying," by Squad-Leader R. M. Hill, M.C., A.F.C. Dates to be arranged for visit to the Aircraft Experimental Station, Martlesham Heath, Suffolk, and a visit to the Royal Aircraft Establishment, Farnborough. All Meetings commence at 8.30 p.m.

Clive O. B. Beale, Hon. Sec., Trinity College, Cambridge.

Cross-Channel Air Services: London-Brussels route.

As the proposals for the operation of the London-Brussels service made by the syndicate approved for subsidy have not matured, the "approval" which had been provisionally given has been withdrawn. Applications for the operation of this service, which should be forwarded to the Secretary, Air Ministry, Kingsway, W.C. 2, before March 1, are, therefore, again invited, on the understanding that only one firm will be subsidised on this route during the present year.

The assistance to be given by the Air Ministry will be on the lines already announced; detailed information with regard to these can be obtained on application.

Cairo-Baghdad Air Mail

THE Postmaster-General states that the Air Mail which was despatched from London on January 26 reached Baghdad on February 5. The next air mail to Baghdad will be dispatched from London on Thursday, February 23.

Navy Economising

WITH the object of effecting economies in the cost of the personnel of the Naval Service, the Admiralty announce that recruiting for the Royal Marines is to cease forthwith, and that officers seconded or attached to the Royal Air Force from the Royal Navy or the Army will not be liable to, nor eligible for, half-pay, whilst they are so seconded or attached.

Three R.A.F. Fatalities.

WE have to record three unfortunate accidents which resulted in the death of three R.A.F. officers and a member of the R.A.E. The first occurred on February 8 last, when Lieut. R. J. Jenkins, M.C., R.A.F., was killed through an Avro, piloted by Observer Officer Hesketh, D.F.C.—who escaped with slight injuries—crashing into some trees just as it was leaving the ground at Farnborough. In the second accident, Flying Officer Geoffrey Robinson, M.C., and Mr. J. S. Mitchell, of the Royal Aircraft Establishment, were both killed when their machine came down in flames at Dropmore Park on the 10th. Major J. H. Vickers, B.A.—R.A.F.—who was close by at the time of the accident, made heroic efforts to extract the unfortunate men from the burning wreckage. The third fatality occurred at Baldonnell Aerodrome, near Dublin, the same day, when Flying Officer B. J. Parry crashed just after leaving the ground, prior to a flight to England.

A Model Club for Brighton and Hove

WE are informed by Mr. A. L. Churcher, of 97, Clarendon Road, Hove, that it is proposed to form a Model Aero Club for this district. Will any of our readers interested please communicate with him to the above address?

S.T.D. Motors, Ltd.

AT the General Meeting of S.T.D. Motors, Ltd., last week, Mr. James Todd, the Chairman, when dealing with the report of the directors, mentioned one point which he thought would interest the shareholders, *viz.*, that the directors had elected to the board of the company in France, Mr. Delage, who is the managing-director of the Nieuport Aeroplane Co., in France, one of the principal suppliers of aeroplanes to the French army, and Admiralty, and they had lately received an important order from the French army for the construction of a number of large aviation motors under the design of Mr. Louis Coatalen. Both Mr. Coatalen and Mr. Delage were confident that there was a profitable opening for the company in France in this direction, as, through the equipment of their works during the War they were especially adapted for the production of heavy aviation motors.

PUBLICATIONS RECEIVED

Criteres de l'Aptitude au Vol en Avion. By Dr. P. Perrin de Brichambaut. Paris: Louis Arnette, 2, Rue Casimir-Delavigne.

Report No. 116. Applications of Modern Hydrodynamics to Aeronautics. By L. Prandtl. National Advisory Committee for Aeronautics, Navy Building, Washington, D.C., U.S.A.

Catalogue

Metal Propellers. The Metal Airscrew Co., Ltd., Regent House, Kingsway, W.C. 2.

AERONAUTICAL PATENT SPECIFICATIONS

Abbreviations: **cyl. = cylinder; I.C. = internal combustion; m. = motors**

The numbers in brackets are those under which the Specifications will be printed and abridged, etc.

APPLIED FOR IN 1920

Published February 16, 1922

20,160. A. FLETTNER. Auxiliary steering-gear for aircraft. (148,236.)
20,635. Dr. E. F. HUTH GES. Wireless signalling for aeroplane sets. (148,804.)
21,054. E. RUMPLER LUFTFAHRZEUGBAU GES. Aeroplane supporting surfaces. (152,308.)
21,064. E. RUMPLER. I.C. engines. (152,314.)
21,069. RUMPLER-WERKE GES. (in liquidation). Aeroplanes. (152,340.)
21,081. E. RUMPLER LUFTFAHRZEUGBAU GES. Supporting-surfaces of aeroplanes. (151,922.)

APPLIED FOR IN 1921

Published February 16, 1922

27,104. RUMPLER-WERKE GES. (in liquidation). Aeroplane with one machine-gun mounted to fire rearwards, or several rigidly mounted parallel. (170,294.)

NOTICE TO ADVERTISERS

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